Microsoft® Multiplan®

Electronic Spreadsheet Program

User's Guide

Microsoft®

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User's Guide

Electronic Spreadsheet Program
Version 4.2

For DOS and OS/2 Systems

Microsoft Corporation

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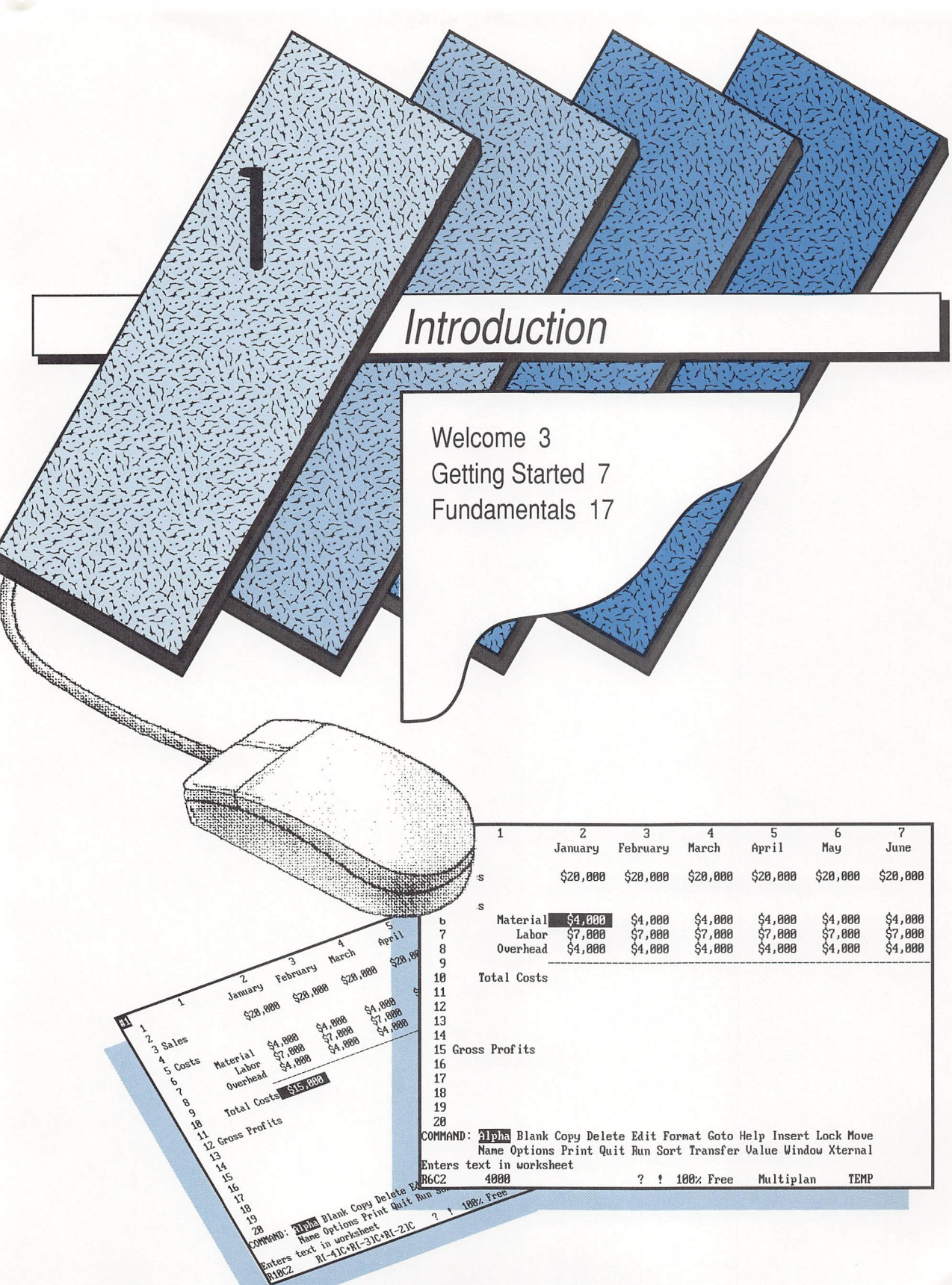
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1 Introduction

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Welcome

Welcome to Multiplan—Microsoft's powerful and easy-to-use electronic spreadsheet program.

In this chapter, you will find:

- A description of Multiplan and what it can do for you.
- An explanation of how to use this manual.

What Is Multiplan?

Microsoft® Multiplan® is an electronic spreadsheet—a worksheet with a large grid of cells, each of which can be words, numbers, or formulas. Multiplan remembers the relationships between the cells on the worksheet, so it can automatically perform calculations. This is where Multiplan's real power comes from.

With Multiplan, you get a chance to ask "what if." What if budgeted costs are 1% higher? What if sales forecasts are 5% low? With Multiplan you can see the effect of such changes quickly.

Alter a critical number and watch the figures change across your worksheet. Observe the effect over time of a small change here, or an improvement there. Use Multiplan to run sensitivity analyses, do budget and resource planning, and schedule more efficiently. You'll soon agree that Multiplan is a vast improvement over hand calculating methods.

Multiplan offers you a worksheet 4,095 rows long and 255 columns wide. By linking several worksheets you can build a chain of worksheets that provide information to each other. You can instantly move, insert, or erase data, widen or shrink columns, or insert or delete space. You eliminate the costly and tiresome work of typing or hand printing the worksheet over and over.

How to Use This Manual

This section explains how the manual is organized, describes how best to use the manual depending on your experience with computers and spreadsheet programs, and explains the conventions used throughout the manual.

How the Manual Is Organized

This manual is divided into five parts:

- "Introduction" tells how to use this manual, gets you started with Multiplan, and introduces you to some fundamental concepts of Multiplan worksheets.
- "Learning Multiplan" teaches the basics of Multiplan. You'll learn by doing a simple financial analysis of a hypothetical firm called Spencer Ceramics.
- "Exploring Multiplan" explains some of the more advanced features of Multiplan. You can try the examples in this section using files included on the Setup disk. The examples in this section are printed in blue type.
- "Multiplan Reference" provides detailed information about Multiplan's features and commands.
- "Appendixes" discusses technical information about using networks and printing, and provides tips and additional information for using Multiplan. Changes since Multiplan versions 3.0 and 4.0 are also included.

Where Should You Begin?

Depending on how familiar you are with spreadsheet programs in general, and with Multiplan in particular, you can choose one of several ways to work with this manual:

- If you are new to personal computers or electronic spreadsheet programs, start with "Fundamentals" and then follow the lessons in "Learning Multiplan" to become familiar with how Multiplan works.
- If you are already familiar with personal computers and basic spreadsheet concepts, start with "Exploring Multiplan" for information on topics and features that interest you.
- If you are an experienced Multiplan user who wants information on commands and functions, start with "Multiplan Reference" and "Appendixes."

Conventions

The following terms and conventions are used throughout this manual:

- ***Filenames*** The names of programs, files, and worksheets appear in all capital letters. For example, SPENCER is a worksheet you will create in Chapter 1.
- ***Command names*** The name of each command appears in initial caps. The names of the command menus precede command names and also appear in initial caps. For example, the Run Report File command refers to the File command on the Run Report menu.
- ***Key names*** The names of keys match the names shown on most IBM and IBM-compatible keyboards. For example, you "Press Enter" to carry out a command.
- ***Key combinations and sequences*** A plus sign (+) used between two key names indicates that you must press them at the same time. For example, "Press Alt+F" means that you press the Alt key and hold it down while you press the F key.

  A comma (,) between two key names indicates that you must press them sequentially. For example, "Press F3, direction key" means that you press the F3 key and release it, and then press one of the direction keys.
- ***Direction keys*** The direction keys are the four arrow keys on your computer's keypad. The name of the individual direction key refers to the direction the arrow points: the Up Arrow key, the Down Arrow key, the Right Arrow key, and the Left Arrow key.
- ***Bold type*** Bold type indicates words or commands that you type. Important words and concepts are also shown in bold type the first time they appear in the manual.
- ***Italic type*** Italic type is used as placeholder text in procedures to indicate variable text that you type. For example, **mp** *filename* means that you type the letters "m" and "p" and a space and then replace *filename* with the name of the file you want to use. Program messages, information about messages, and function arguments are also shown in italic type.
- ***Lists*** Procedures are shown in numbered lists. Single-step procedures are preceded by a triangle symbol (►). Square bulleted (■) lists provide information but not procedural steps.
- ***Procedures*** Procedures are preceded by a special symbol (▮▮▮▮) to make them easy to locate in the text.
- ***Mouse icons*** Mouse procedures and notes about how to use the mouse are preceded by a mouse icon () to make them easy to locate in the text. The chapters in the "Introduction" section contain separate numbered procedures to explain how to complete certain tasks using a mouse. The other chapters in this manual assume you are using a keyboard; tips for using a mouse are sometimes included.

Special Headings

The following notes are used to emphasize information in this manual:

NOTE This information is not critical, but may be helpful to you.

IMPORTANT This information is necessary to avoid frustration and inconvenience.

WARNING This information is critical. If you don't follow the instructions, you could lose data.

Example Files

Example files are included on Multiplan's Setup disk. Use these files to try out the examples in "Exploring Multiplan" and for suggestions on how to use Multiplan. To see a list of the files, insert the Utilities disk into the A drive, and type **a:showme**.You can copy these files to your hard disk or back-up floppy disks when you run the SETUP program to install Multiplan.

Getting Started

This chapter tells you what you need to know to get started with Multiplan. In this chapter you will learn:

- What equipment you need to run Multiplan.
- How to set up Multiplan.
- How to start Multiplan.
- How to use worksheets from previous versions of Multiplan.
- How to use the Multiplan keyboard.
- How to use Multiplan with a mouse.
- What to do if you have problems with Multiplan.

What You Need

To set up and use Multiplan, you need the following hardware and software:

- An IBM Personal Computer, PS/2, or compatible with:
  - DOS version 2.0 or higher or OS/2 version 1.0 or higher
  - On DOS computers, at least 384K of random access memory (RAM) available after loading DOS and any terminate-and-stay-resident programs
  - Two floppy disk drives, or one floppy disk drive and one hard disk
- One of the following monitor adapters or compatibles:
  - IBM Monochrome Display Adapter
  - IBM Color Graphics Adapter (CGA)
  - IBM Enhanced Graphics Adapter (EGA)
  - IBM Video Graphics Array (VGA)
  - Hercules Graphics Card
  - Hercules Graphics Plus Card
  - Hercules InColor Card
  - AT&T 6300 Graphics Card (also called the Olivetti Graphics Card and the AT&T Display Enhancement Board)
  - Ericsson Graphics Card
- An 80-column monitor compatible with your monitor adapter
- Multiplan disks
- An optional Microsoft® Mouse (serial, parallel, or InPort®) or compatible
- An optional printer

Setting Up Multiplan

Although the procedure for setting up Multiplan is designed to be as simple as possible, you should be familiar with using disks and files before you begin.

Backing Up Your Multiplan Disks

Multiplan comes on three 5.25-inch or two 3.5-inch floppy disks. Make backup copies of your disks before you begin the following setup procedure. Be sure to label your copies and store the original disks in a safe place—a cool, dry area out of direct sunlight, and away from magnets, telephones, and electronic equipment. From now on, use the copies when you work with Multiplan.

How to Use the SETUP Program

The SETUP program is on the Setup or Setup/Utilities disk that came in your Multiplan package. Use the SETUP program to:

- Install Multiplan on a hard disk system, a floppy disk system, or a network.
- Configure Multiplan for your video adapter.
- Install a printer driver.

Use the following instructions to install Multiplan on your hard disk or floppy disk system. For information on how to install Multiplan on a network, see Appendix A, "Using Multiplan on a Network."

To use the SETUP program

1. If your computer is not already turned on, start your computer.
2. Insert the Setup disk into drive A and close the drive.
3. Type **a:setup** and press Enter.
4. Follow the directions on the screen.

The SETUP program installs Multiplan on your hard disk or floppy disks.

NOTE When you run Multiplan with some Color Graphics Adapters, most notably the IBM CGA card, a flickering may occur, and spots may appear on the screen. This problem does not damage the screen or the computer, but it can be annoying. Multiplan has a screen driver that minimizes the problem. If your screen flickers or if spots appear, run the SETUP program and choose "IBM Color Graphics (Snow Control)" from the video display adapter menu.

If you set up Multiplan on a 360K floppy disk, then you cannot use the online Help file. The combined size of the Multiplan program (MP.EXE) and the Multiplan Help file (MP.HLP) is larger than 360K.

Starting Multiplan

Use the following instructions to start Multiplan from a hard disk or a floppy disk system. Before you start Multiplan, you must either change to the directory where Multiplan is installed using the DOS or OS/2 Chdir command or you must include this directory in the command search path using the DOS or OS/2 Path command. For more information on directories, subdirectories, and paths, see your DOS or OS/2 manual.

For information on starting Multiplan from a network, see Appendix A, "Using Multiplan on a Network."

Starting Multiplan from a Hard Disk

These instructions assume your hard disk is drive C and that Multiplan is installed in a directory called MP. If you want to use a different drive or directory, you must substitute your drive or directory name in the instructions. If you have included Multiplan in the command search path using the DOS or OS/2 Path command, then you can omit steps two and three in the following procedure.

To start Multiplan from a hard disk

1. If you have not already done so, turn on your computer and go through its normal startup procedure.
2. At the system prompt, type **c:** and press Enter.

   This switches you to drive C. If Multiplan is installed on another drive, type the letter corresponding to that drive and press Enter.
3. Type **cd \mp** at the system prompt and press Enter.

   This switches you to the MP directory. If you want to start Multiplan from another directory, type **cd** *directoryname* and press Enter.
4. To start Multiplan, type **mp** at the system prompt and press Enter.

   If Multiplan fails to start, review the setup instructions to make sure that the Multiplan files are installed correctly. Make sure you start Multiplan from the correct drive and directory.

NOTE When running Multiplan under OS/2, the following lines must appear in the CONFIG.SYS file (or in the CONFIG.OS2 file on dual-boot machines):

```
IOPL=YES
MEMMAN=SWAP,MOVE
```

With OS/2 versions 1.1 and later, you can also use IOPL=MP.

If these lines do not appear in the OS/2 CONFIG.SYS or CONFIG.OS2 file, edit the file and add these lines, and then save the file and restart your machine. For more information, see your OS/2 manual.

Starting Multiplan from a Floppy Disk

These instructions assume that you are starting Multiplan from disk drive A. If you are starting Multiplan from a hard disk, see the preceding section. To start Multiplan from a floppy disk, you must use DOS version 2.0 or higher.

To start Multiplan from a floppy disk

1. If you have not already done so, turn on your computer and go through its normal startup procedure.
2. Remove the DOS disk from drive A, insert your copy of the Multiplan Program disk, and close the disk drive's door.
3. Type **mp** at the system prompt (A>) and press Enter.

   If Multiplan fails to start, review the setup instructions to make sure that the Multiplan files are installed correctly on the floppy disk.

Starting Multiplan with Command Line Switches

You can start Multiplan with any of the following command line switch options:

Type **mp /k** and press Enter to run Multiplan with terminate-and-stay-resident programs such as SideKick while using an extended keyboard, or if you are using a keyboard that is not 100% IBM compatible.

Type **mp /l** (the letter "l") and press Enter to disable the form-feed character when using the generic TEXT print driver.

Type **mp /n** to have Multiplan create an MP.INI file in the directory from which you start Multiplan, rather than where the MP.EXE file is installed. This option is chosen automatically if you're running Multiplan on a network or under OS/2.

Type **mp /u** to have Multiplan display the U.S. symbols described in the next section.

Type **mp /z** to have Multiplan display the international symbols described in the next section.

Only the last two options are retained in the MP.INI file. For more information, see "The MP.INI File" in Appendix C, "Tips and Additional Information About Multiplan."

Using the International Display Option

When you start Multiplan, it examines the country code setting in your CONFIG.SYS file. For information on country code settings, see your DOS or OS/2 manual. If the country code is not 1 (U.S.), then Multiplan makes the following changes:

- The $ formatting symbol is displayed in cells as a local currency symbol.
- Multiplan recognizes dates and times when you type them in a local format.
- Multiplan's built-in date and time formats appear in the local style (for example, the day may precede the month) when they are displayed in a list.
- The comma, instead of the period, may become the decimal separator. For more information on the effects of changing the decimal separator, see "Format Options" in Chapter 13, "Commands."

Multiplan also changes certain symbols based on the country code. Here is list of symbols that change depending on whether or not the country code is set to 1 (U.S.):

The symbol used to indicate	Is displayed in the U.S. as	Is displayed internationally as
Relative references	[ ]	( )
That a column is too narrow	a series of #	a series of !
A window number	#	-
An error value	# (followed by the error value)	no initial symbol is used, only the error value itself

If you start Multiplan with the /u command line switch, Multiplan displays the U.S. symbols shown in the second column of the preceding table, even if the country code is not 1. Similarly, if you start Multiplan using the /z command line switch, Multiplan displays the international symbols shown in the third column of the table, even if the country code is 1. The /u and /z switches do not change the currency symbol, the date and time formats, or the decimal separator. The /u and /z command line switches change the MP.INI file so that Multiplan displays the symbols you want every time you start the program.

For more information on setting the country code, see your DOS or OS/2 manual.

Using Worksheets from Previous Versions of Multiplan

Multiplan 4.2 includes a new Normal file format that loads and saves worksheets much faster than Multiplan 4.0. If you load worksheets created in Multiplan version 2.0 or 3.0, the Normal mode is automatically selected when you choose the Transfer Save command. To save worksheets from Multiplan version 4.0 using the Normal mode, you must choose Transfer Save and select Normal.

In general, you may want to save worksheets in the Normal format to take advantage of the increased speed. For more information on file formats, see "Transfer Options" and "Transfer Save" in Chapter 13, "Commands." For more information on converting worksheets from previous versions of Multiplan, see Appendix C, "Tips and Additional Information About Multiplan."

The Multiplan Keyboard

The following keyboard tables describe the four basic types of actions that you can perform with the Multiplan keyboard: moving the cell pointer, scrolling through the window, selecting and carrying out commands, and editing cells and commands.

Each table is divided into three columns. The first column in each table lists an action or task you can perform. The second column shows the keystrokes you use to perform the action if you have an IBM PC, PS/2, or compatible keyboard. The third column shows the keystrokes you use to perform the action on any keyboard.

You can use either uppercase or lowercase letters for the keystrokes.

Moving the Cell Pointer

Action	IBM PC	All keyboards
Up	The Up Arrow key	Ctrl+E
Down	The Down Arrow key	Ctrl+X
Left	The Left Arrow key	Ctrl+S
Right	The Right Arrow key	Ctrl+D
Next window	F1	Ctrl+W or ;
Previous window	Shift+F1	Ctrl+R, Ctrl+W
Next unlocked cell	F2	Ctrl+F or Linefeed
Previous unlocked cell	Shift+F2	Ctrl+R, Ctrl+F

Scrolling Through the Window

Action	IBM PC	All keyboards
Page up	PgUp	Ctrl+R, Ctrl+E
Page down	PgDn	Ctrl+R, Ctrl+X
Page left	Ctrl+Left Arrow	Ctrl+R, Ctrl+S
Page right	Ctrl+Right Arrow	Ctrl+R, Ctrl+D
Home	Home	Ctrl+Q
End	End	Ctrl+Z
Home window	Ctrl+Home	Ctrl+R, Ctrl+Q

Selecting and Carrying Out Commands

Action	IBM PC	All keyboards
Cancel	Esc	Ctrl+C
Enter (Return)	Enter	Return or Enter
Select next item	Spacebar or Tab	Spacebar
Select previous item	Backspace or Backtab	Backspace or Ctrl+H
Tab	Tab	Tab or Ctrl+I
Backtab	Shift+Tab	Ctrl+R, Ctrl+I
Help	Alt+H or ?	?
Recalculate	F4	!
Alternate	Alt	Ctrl+A or Alt
Select range	F6 or :	:

Editing Cells and Commands

Action	IBM PC	All keyboards
Delete	Del	Delete or Ctrl+Y
Backspace	Backspace	Backspace or Ctrl+H
Character left	F9	Ctrl+K
Character right	F10	Ctrl+L
Word left	F7	Ctrl+O
Word right	F8	Ctrl+P
Reference	F3	@
Function enumeration	Shift+F3, direction key	@, @, direction key
Name enumeration	F3, direction key	@, direction key
Edit macro (on or off)	F5	Ctrl+V
Single step through macro (on or off)	Shift+F5	Ctrl+T
Record macro (on or off)	Shift+F9 or Shift+F7	Ctrl+R, Ctrl+R
Refresh links	Shift+F6	Ctrl+R, Ctrl+U
Edit home	Shift+F8	Ctrl+R, Ctrl+O
Edit end	Shift+F10	Ctrl+R, Ctrl+P

Getting Help on the Keyboard

You can also see the keyboard tables on the screen by choosing the Help command.

To get online help on keyboard actions

1. When the main command menu is active, choose Help by pressing H or by pressing the ? key.
2. Choose Keyboard by pressing K.
3. Scroll through the tables by pressing N to see the next screen and P to see the previous screen.
4. To return to Multiplan, choose Resume by pressing R.

Using a Mouse

If you have already installed a Microsoft mouse or compatible with your computer, it will work with Multiplan. For complete instructions on how to install and use a mouse, see your mouse manual.

If the mouse is installed and set up correctly, the mouse pointer appears in the middle of the screen when you start Multiplan. The mouse pointer shows the mouse's position on the screen.

With the mouse, you can perform most of the same Multiplan tasks that you can with the keyboard. However, the mouse provides the convenience of selecting objects, choosing commands, and moving around the worksheet by pointing and clicking mouse buttons instead of typing. Selecting cell ranges and entering formulas are especially easy with the mouse.

There are three basic kinds of mouse actions:

- You can **move** the mouse pointer by rolling the mouse around on a desktop or other flat surface. Moving the mouse pointer to a specific position is called **pointing**.
- You can **click** (push and release) the mouse buttons: left only, right only, or both together, depending on what operation you want to perform.
- You can **drag** the mouse pointer by moving the mouse while holding down one of the mouse buttons.

Microsoft Product Support

If you have a question about Multiplan, first look in this manual or consult the online Help for the solution. If you cannot find the answer, call our Product Support staff by dialing the telephone number on your Product Assistance Request form.

If you call, you should be near your computer and have the following information at hand:

- The name and version of the product you are using
- The type of hardware you are using
- The exact wording of any messages that have appeared on your screen
- What happened and what you were doing before the problem occurred
- How you tried to solve the problem

Fundamentals

This chapter explains the fundamental concepts of the Multiplan worksheet. You will learn how to:

- Use the rows and columns to identify the cells of the worksheet.
- Move the cell pointer to different parts of the worksheet.
- Move the cell pointer quickly using the Goto command.
- Choose commands.
- Select a range of cells.
- Edit information.
- Get information with the Help command.
- Exit Multiplan with the Quit command.

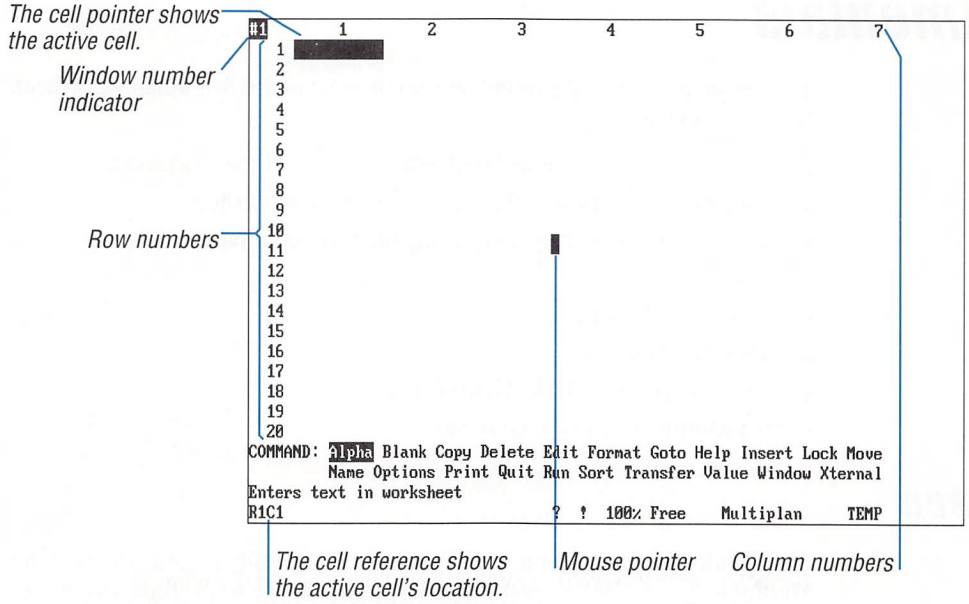
The Screen

Once Multiplan is set up on your system, you are ready to take a look at the Multiplan screen. Before you start Multiplan, change to the directory where Multiplan is installed. If the directory was added to your DOS or OS/2 command search path, you can start Multiplan from the main directory.

To start Multiplan

► At the system prompt, type **mp** and press Enter.

The Multiplan screen displays only a small portion of the actual worksheet. Imagine your screen as a window to your worksheet. With Multiplan, you can view information on different parts of the worksheet by scrolling through the window.



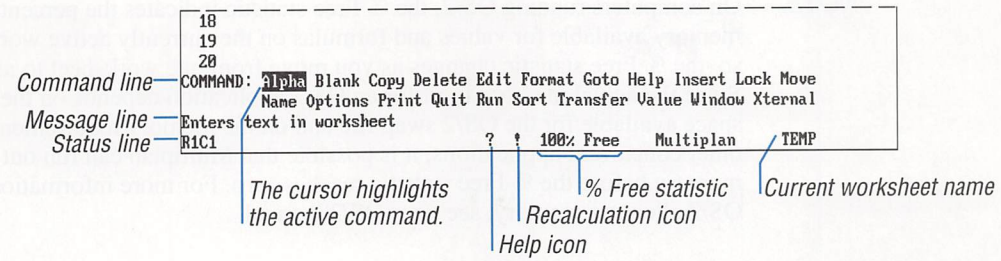
If you have a mouse installed, the **mouse pointer** appears in the center of the screen when you start Multiplan.

The **window number indicator** in the upper-left corner of the screen identifies the active window. The # symbol may appear as a hyphen (-) depending on the country code setting in your CONFIG.SYS file or the startup switch you use to start Multiplan.

The entire worksheet is 255 columns wide and 4,095 rows long. Columns are vertical, and are numbered across the top. Rows are horizontal, and are numbered on the left side. Imagine lines running vertically between the columns and horizontally between the rows to form boxes on the worksheet. Each box is called a **cell**.

When you start Multiplan, the **cell pointer** is in the upper-left corner of the window. The cell pointer is a highlighted area that shows you the active cell. The active cell is the cell that is available for immediate use.

A cell is identified by its **location**. A cell's location is described by row and column number, with the row number always given first. For example, the cell at "row 1, column 1" (R1C1) is the active cell when you first start Multiplan. Multiplan always displays the location of the active cell in the lower-left corner of the screen. A cell's location is also called a **reference**.



The two lines below the worksheet area are collectively called the **command line**. It displays the main command menu or the command you have chosen and the new options available to you.

The line below the command line is called the **message line**. It displays information about commands. After you choose a command, the message line tells you what the command does or what kind of response the command needs from you.

The bottom line of the screen is called the **status line**. It displays the location of the active cell and what the active cell contains, and the name of the worksheet you are using. Until you give your worksheet a name, Multiplan calls it TEMP. The word "Multiplan" in the status line changes to a two-letter code during certain operations:

- NL means NumLock.
- EX means Extended.
- RM means Record Macro.
- CM means Command Menu.
- ST means Single Step.
- SL means Scroll Lock.
- CL means Caps Lock.
- EM means Edit Macro.

The number labeled "% Free" in the center of the status line is called the **% Free statistic**. It has different meanings depending on whether you are using a computer running DOS or one running OS/2.

The "!" on the status line is called the **recalculation icon**. It appears only if you have a mouse installed. Click it with the mouse to recalculate values in the worksheet. Press F4 to recalculate without a mouse.

The "?" on the status line is called the **Help icon**. It appears only if you have a mouse installed. Click it with the mouse to get **context-sensitive** online help. Context-sensitive help means that the information presented will help you in your current situation. Press Alt+H to get help without a mouse.

NOTE On computers running DOS, the % Free statistic indicates the percentage of memory that is available to the entire Multiplan session. So if you have several worksheets loaded, the % Free statistic remains the same regardless of which worksheet is active.

NOTE On computers running OS/2, the % Free statistic indicates the percentage of memory available for values and formulas on the currently active worksheet, so the % Free statistic changes as you move from one worksheet to another. Since the actual memory limit for an OS/2 application depends on the disk space available for the OS/2 swap file and on the memory requirements of other concurrent applications, it is possible that Multiplan can run out of memory before the % Free statistic reaches zero. For more information on how OS/2 allocates memory, see your OS/2 manual.

Moving the Cell Pointer

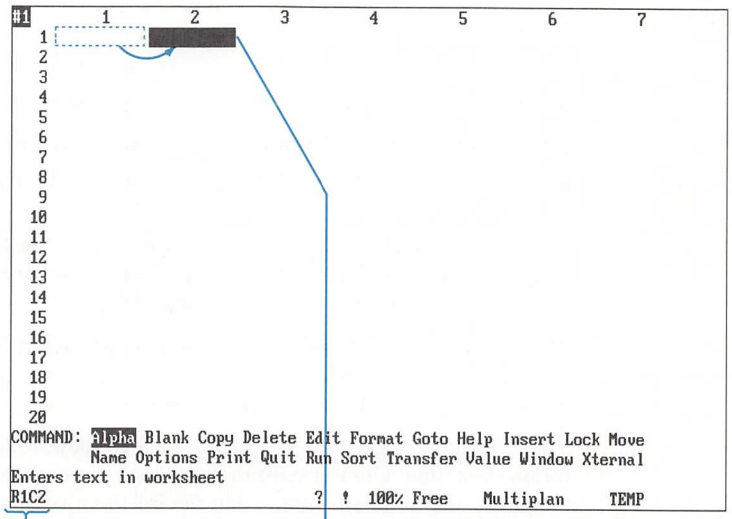
The direction keys (the Up Arrow, Down Arrow, Left Arrow, and Right Arrow keys) move the cell pointer around the worksheet. You can also move the cell pointer with a mouse.

To move the cell pointer

► Press a direction key.

1 Point (move the mouse pointer) to the cell you want.

2 Click either mouse button.



The active cell's location is shown here.

R1C2 is now the active cell.

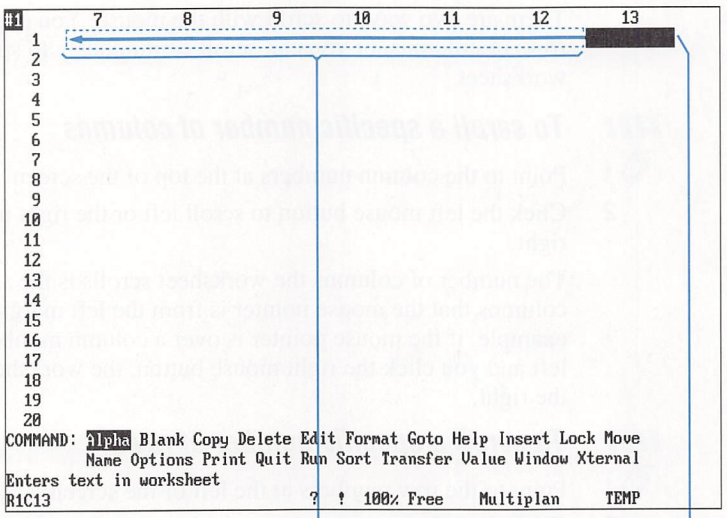
Scrolling Through the Worksheet

When you start Multiplan, your screen shows you columns 1 through 7. To see other rows and columns, you need to scroll through the worksheet.

To scroll through the worksheet

1. Press a direction key until the cell pointer reaches the top, bottom, left, or right edge of the screen.
2. Hold the appropriate direction key down until you reach the row or column you want (press the Left Arrow or Right Arrow key to scroll to a column; press the Up Arrow or Down Arrow key to scroll to a row).

   Notice that the cell pointer remains still, but the rows or columns move beneath it. This is called **scrolling**.



As you press the Right Arrow key, the columns scroll to the left.

The cell pointer remains still.

The direction keys move the cell pointer by one row or one column. There are several keys you can use to move more rapidly around the worksheet.

Key name	Moves the cell pointer
PgDn	Down one screen
PgUp	Up one screen
Home	To the first cell in the worksheet
End	To the cell corresponding to the last row and column with data in it
Ctrl+Left Arrow	Left one screen
Ctrl+Right Arrow	Right one screen

Scrolling with a Mouse

There are two ways to scroll with the mouse. You can scroll a specific number of rows or columns, or you can scroll continuously to specific parts of the worksheet.

To scroll a specific number of columns

1. Point to the column numbers at the top of the screen.
2. Click the left mouse button to scroll left or the right mouse button to scroll right.

   The number of columns the worksheet scrolls is the same as the number of columns that the mouse pointer is from the left margin of the screen. For example, if the mouse pointer is over a column number that is fourth from the left and you click the right mouse button, the worksheet scrolls four columns to the right.

To scroll a specific number of rows

1. Point to the row numbers at the left of the screen.
2. Click the left mouse button to scroll up, or the right mouse button to scroll down.

   The number of rows the worksheet scrolls is the same as the number of rows the mouse pointer is from the top of the screen. For example, if the mouse pointer is over a row number that is fourth from the top and you click the right mouse button, the worksheet scrolls four rows down.

To scroll continuously

1 Point to the worksheet area, and press and hold down one of the mouse buttons.

2 Drag the mouse in the direction you want to scroll.

When the mouse pointer reaches the edge of the window, the screen scrolls one row or column at a time.

3 Release the mouse button to stop scrolling.

Scrolling with this method selects a range of cells. To deselect the cells, press both mouse buttons. For more information on selecting, see "Selecting a Range of Cells" later in this chapter.

You can scroll an entire page at a time by moving the mouse pointer all the way to the right of the screen for columns or to the bottom of the screen for rows, and then clicking the appropriate button.

For information on scrolling long distances through the worksheet using a technique called "thumbing," see "Thumbing with a Mouse" in Appendix C, "Tips and Additional Information About Multiplan."

Moving to a Specific Cell

You can move to a nearby cell quickly with the direction keys, but you can reach a distant cell more quickly with the Goto command. With the Goto command, you specify a cell's location to move the cell pointer to that cell.

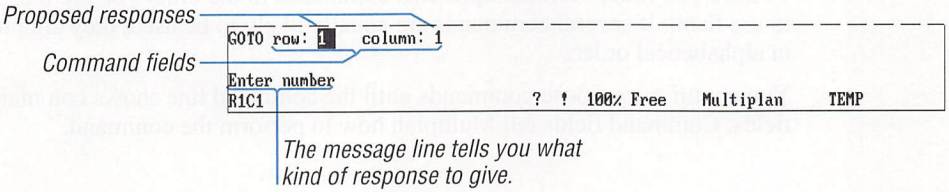
To reach a cell with the Goto command

1 Choose Goto by pressing G.

The command line displays the command you have chosen and the new choices available to you.

2 Choose Row-col by pressing R.

Row-col is a **subcommand** of Goto.



In the command line, the words "row" and "column" are the names of **command fields**. Command fields are where you tell Multiplan how you want a specific command to be carried out. Entries in command fields are called **responses**.

The highlighted area appearing after "row" is called the **cursor**. The cursor shows where you should enter your response in the command field. The message line (the line below the command line) tells you what kind of response Multiplan needs.

3 Type the row number of the cell you want to reach.

If you make a mistake while typing, press Backspace and retype to correct your mistake.

4 Press Tab to move the cursor to the "column" field.

If the cursor is on the last command field when you press Tab, the cursor returns to the first command field. Pressing Shift+Tab moves the cursor to the previous command field.

5 Type the column number of the cell you want to reach.

6 Press Enter to carry out the command.

The cell pointer goes to the cell you specified.

Choosing a Command

In the process of learning to move around the worksheet, you learned how to choose the Goto command.

A command instructs Multiplan to do something. The commands you use with Multiplan appear in the command line. The lists of commands are called **menus**. You choose a command from a menu by pressing the first letter of that command, or by pressing the Spacebar or Tab to select the command and then pressing Enter.

You press the Spacebar to move the cursor forward (left to right) in a menu, and you press Backspace to move the cursor backward (right to left) in a menu.

To save you time, Multiplan presents commands in the order you are most likely to use them. If several commands are equally likely to be used, they are presented in alphabetical order.

You continue to choose commands until the command line shows command fields. Command fields tell Multiplan how to perform the command.

To choose a command

► Press the first letter of the command you want.

If you press a letter that does not begin any command, such as the letter J, Multiplan sounds a tone and displays the message, *Not a valid option*. If you press the wrong command letter, press Esc before you choose another command.

► Point to the command name in the menu and click the left mouse button.

This takes you to the next level of commands. Point, and click the left mouse button again to choose subcommands.

NOTE Clicking the right mouse button in the menu automatically carries out the proposed response. For example, Load is the proposed response in the Transfer command. If you move the mouse pointer to Transfer and click the right mouse button, Multiplan automatically selects Transfer and Load, and immediately moves to the Transfer Load "filename" field. Until you are familiar with Multiplan, use the left button to choose commands, or you may get results that you didn't intend.

To choose a command with the Spacebar

1. Press the Spacebar until the cursor is on the command you want.

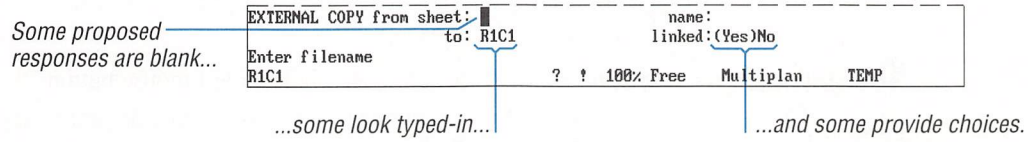
   The cursor moves from left to right along the command line, stopping at each command name.

2. Press Enter to carry out the command.

Filling in Command Fields

When you first select a command, Multiplan guesses what you are most likely to want in the command fields. These guesses are called **proposed responses**. Multiplan bases its guesses on your previous responses in command fields and on general worksheet information. For example, the proposed responses you saw when you used the Goto Row-col command were based on the current position of the cell pointer.

When the command line shows command fields, each command field includes a proposed response. In some command fields, the proposed response is a blank. In other command fields, the proposed response looks like a typed-in response. Some fields provide two or more choices.



The active command field is highlighted by the cursor. In fields that have a menu of possible responses, the proposed response is highlighted by the cursor (when the cursor is in that field) or enclosed in parentheses (when the cursor is in another field).

If you agree with a proposed response, press Enter to carry out the command, or press Tab to move to the next command field. If you do not want the proposed response, you can change it by pressing the Spacebar or Backspace, or by typing a different response.

You can press Enter whenever the responses in all the command fields are correct; you are not required to move the cursor first.

When a command has been carried out, Multiplan returns to the main command menu.

Some command fields are enumerated fields. For these fields, you can press a direction key to display a list of possible responses. Press a direction key again to move the cursor to the response you want to enter in the field, or press PgUp and PgDn if there are more choices than will fit on one screen. Press Enter to carry out the command, or press Tab to move to the next command field. For an example of an enumerated field, see "Displaying Information: The Format Default Cells Command" in Chapter 1, "Creating a Worksheet." For information on using enumeration with disk drives, directories, subdirectories, and filenames, see "Transfer Load" in Chapter 13, "Commands."



To display a list using a mouse, point to the enumerated field and click the right mouse button.

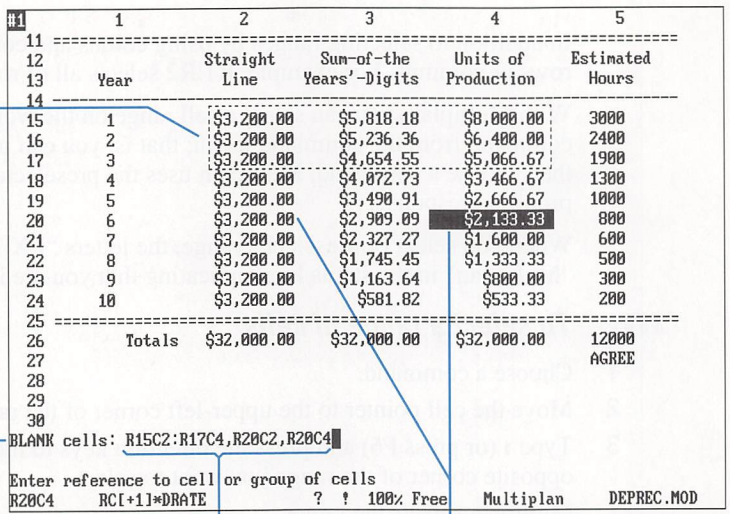
Selecting a Range of Cells

With Multiplan, you can perform tasks on more than one cell at a time by selecting a **range**. A range is any group of cells you identify to Multiplan. Ranges can be composed of groups of cells that are next to each other, individual cells, or even entire rows and columns.

For example, you could clear several cells at once by choosing the Blank command. Multiplan would need to know which cells to clear, so you would select the range of cells either before or after choosing the Blank command. After choosing a command, the most common way to select a range is to type two cell locations separated by a colon. For example, typing R4C2:R6C4 selects all the cells in the rectangular block from R4C2 to R6C4, inclusive. You can select ranges this way when the cells in the range are all **contiguous**; that is, when they are all next to each other.

You can also select lists of cells by using a comma (,). You usually do this with cells that are **noncontiguous**; that is, with cells that are not next to each other.

For example, you can choose the Blank command by pressing B and then clear the contents of a range of contiguous and noncontiguous cells.

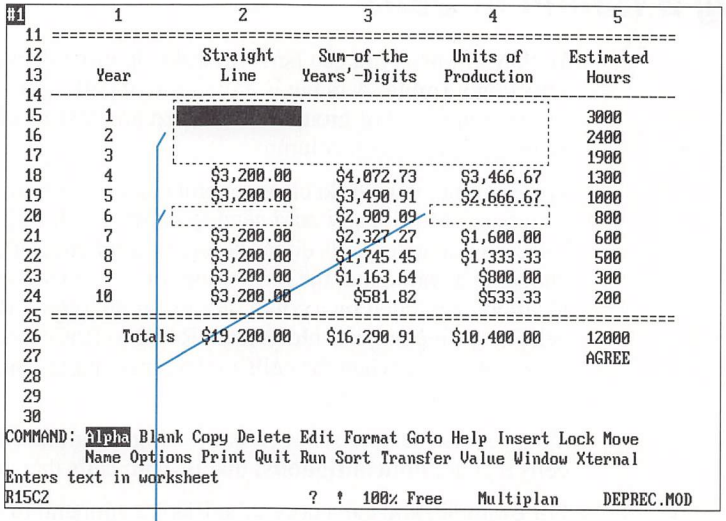


R15C2:R17C4 are contiguous cells.

Pressing B chooses the Blank command.

You enter the responses in the "cells" field.

R20C2 and R20C4 are noncontiguous cells.



Pressing Enter carries out the command and clears the range of cells.

In addition to selecting ranges by using colons and commas, you can select entire rows or columns. For example, R1:R2 selects all of rows 1 and 2.

With Multiplan, you can select a cell range on the worksheet before you choose a command from the command menu; that is, you can **preselect** a range. When you then choose a command, Multiplan uses the preselected cell range as the proposed response.

When you select or preselect a range, the letters "EX" replace the word "Multiplan" in the status line, indicating that you are in extended mode.

To select a range of cells

1. Choose a command.
2. Move the cell pointer to the upper-left corner of the range you want to select.
3. Type **:** (or press F6) and press the direction keys to move the cell pointer to the opposite corner of the range you want to select.

   Multiplan selects the range.

1. Point to the command name and click the left mouse button.
2. Point to the upper-left corner of the range.
3. Drag the mouse diagonally to the opposite corner of the range.
4. Release the mouse button.

To preselect a range of cells

1. Move the cell pointer to the upper-left corner of the range you want to select.
2. Type : (or press F6) and press the direction keys to move the cell pointer to the opposite corner of the range you want to select.
3. Choose a command.

1. Point to the upper-left corner of the range.
2. Press and hold down one of the mouse buttons.
3. Drag the mouse diagonally to the opposite corner until the entire range is highlighted.
4. Release the mouse button.
5. Choose a command.

Multiplan uses the preselected range as the proposed response in the command. When you press Enter, Multiplan carries out the command on the selected range.

You can preselect cell ranges for most Multiplan commands. Many commands, such as Insert Column and Format Width, do not explicitly take cell references, but nevertheless use preselected areas. For example, the Delete Row command uses the preselected area for the proposed responses in the "# of rows," "starting at," "between columns," and "and" fields.

Canceling a Command

At any time before you press Enter to carry out a command, you can cancel it.

To cancel a command

- Press Esc.

When you press Esc, the main command menu appears and the worksheet appears as it did before you began the command.

- Click both mouse buttons simultaneously while the mouse pointer is in the command line.

Editing Command Fields and Cells

You can edit information in command fields and cells. You can delete or change Multiplan's proposed responses with the editing keys. If you make a mistake and enter the wrong information in a cell, or if you need to update the information in a cell, you can either type the new information, or you can edit the existing information using the editing keys and the Edit command.

Using Editing Keys

Editing keys can delete information, move the cursor, change references, or enter names while you are editing. Here is a list of the editing keys:

Key	Does this
Backspace	Erases the character to the left of the highlighted area
Del	Erases the characters that are highlighted
F3	Changes the highlighted relative reference to an absolute reference (you can also enter names by pressing F3 followed by a direction key, and then selecting a name from the list)
F7	Moves the cursor one word to the left
F8	Moves the cursor one word to the right
F9	Moves the cursor one character to the left
F10	Moves the cursor one character to the right
Shift+F8	Moves the cursor to the beginning of the highlighted area
Shift+F10	Moves the cursor to the end of the highlighted area

For more information on editing keys, see "The Multiplan Keyboard" in the "Getting Started" chapter, or consult the *Microsoft Multiplan Quick Reference Guide*. You can also choose the Help Keyboard command.

Editing Proposed Responses

You can edit proposed responses any time you are entering information in command fields. After editing the proposed responses, press Enter to carry out the command.

- To replace the proposed response, type the new information. Multiplan automatically deletes the proposed response as you type the new one.
- To delete the proposed response and leave the field empty, press Del. The proposed response disappears.
- To add text to the proposed response, press one of the editing keys to move the cursor where you want to add text, and type the additional text.
- To edit another proposed response, press Tab to move the cursor to the field you want to edit.

Editing Information in a Cell

With Multiplan you can edit information already entered in a cell.

To edit a cell

1. Move the cell pointer to the cell you want to edit.
2. Choose Edit by pressing E.

   The contents of the cell appear in the command line. (If a formula is too long to appear in full in the status line, you can choose the Edit command to display the formula.)
3. Use the editing keys to move the cursor, insert new information, and delete or replace old information.
   - To insert new information, move the cursor to the character that should follow the new information, and type the new information. Multiplan inserts the information in front of the cursor.
   - To delete information, move the cursor to the last character you want to delete, and press Backspace to delete characters to the left of the cursor, or press Del to delete what is highlighted by the cursor.
   - To replace information, move the cursor to the last character you want to replace, delete the old information by pressing Backspace or Del, and type the new information.
4. Press Enter or press one of the direction keys to enter the edited information when you are satisfied with the changes you have made.

   If you do not want to save the changes, press Esc at any time to return to the main command menu.

Getting Help

Multiplan provides both general and specific help; you can scroll through all of the online Help file or just part of it. The Help command can also adapt the information it presents to your current situation. This kind of help is called context-sensitive help.

To get general information

1 At the main command menu, choose Help by pressing H.

Multiplan displays the beginning of the Help file. You can use the subcommands in the Help menu to move through the Help information until you find the topic you want.

2 Press R (for Resume) or Esc to return to the main menu.

To get context-sensitive help

1 Move the cursor to the command, field, or other area of the screen for which you need help.

2 Press Alt+H, or press ?.

Now Multiplan displays the Help information for your current situation.

Whenever you request Help information with the ? key, the information describing the command you have chosen is listed at the top of the screen.



1 Move the cursor to the command, field, or other area of the screen for which you need help.

2 Point to the Help icon (?) at the bottom of the screen and click either mouse button.

Clearing a Worksheet

If you want to clear an entire worksheet without exiting and then restarting Multiplan, you can choose the Transfer Clear All command.

To clear a worksheet

1. Choose Transfer by pressing T.
2. Choose Clear by pressing C.
3. Choose All by pressing A.
4. Press Y if you want to save the changes you have made; otherwise, press N.

Exiting Multiplan

You can exit Multiplan with the Quit command.

To quit Multiplan

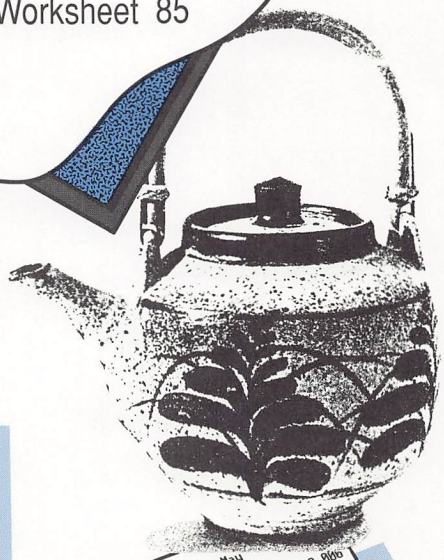
► Choose Quit by pressing Q.

Multiplan returns you to the system prompt.

2

Learning Multiplan

1 Creating a Worksheet 37
2 Using Formulas 63
3 Printing a Worksheet 85



#1

	1	2 January	3 February	4 March	5 April	6 May	7 June
1							
2							
3	Sales	$20,000	$20,000	$20,000	$20,000	$20,000	$20,000
4							
5	Costs						
6	Material	$4,000	$4,000	$4,000	$4,000	$4,000	$4,000
7	Labor	$7,000	$7,000	$7,000	$7,000	$7,000	$7,000
8	Overhead	$4,000	$4,000	$4,000	$4,000	$4,000	$4,000
9							
10	Total Costs	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000
11							
12	Gross Profits	$5,000					
13							
14							
15							
16							
17							
18							
19							
20							

COMMAND: Alpha Blank Copy Delete Edit Format Goto Help Insert Lock Move
Name Options Print Quit Run Sort Transfer Value Window Xternal
Enters text in worksheet
R12C2 Sales-Total_Costs ? ! 100% Free Multiplan SPENCER

1 Creating a Worksheet

In "Fundamentals," you learned about the parts of the Multiplan screen and how to move around the screen by pressing keys and choosing the Goto command. You also learned about commands and command fields.

In this chapter, you will create a worksheet. You will learn how to:

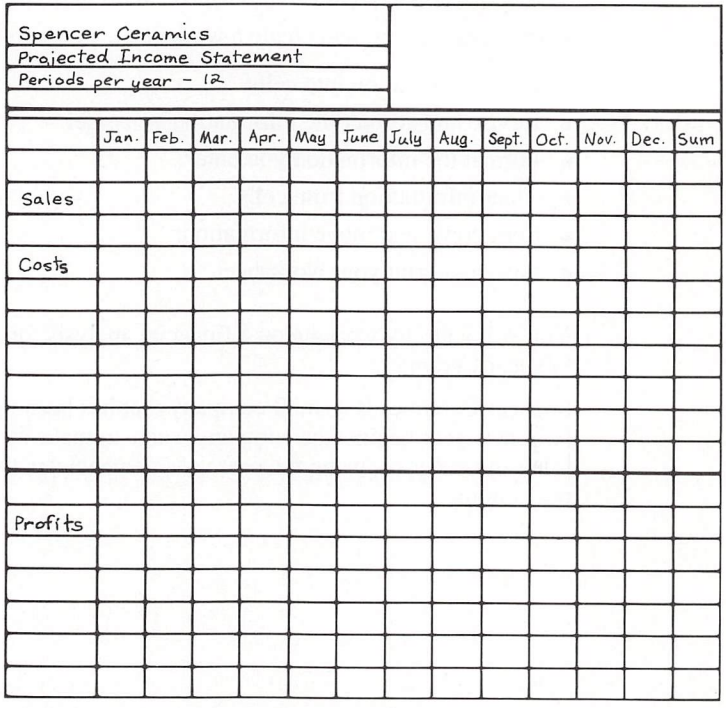
- Enter information into cells.
- Revise and correct the information you enter.
- Format the information you enter.
- Clear information from cells.
- Sort, copy, and move information.
- Save and print your worksheet.

You will learn by working on a financial analysis for a hypothetical company—Spencer Ceramics.

Spencer Ceramics is a small company that has been operating for about one year. As a new year begins, the company wants to make some rough predictions about sales and expenses using the past year's financial activity as the basis for the projections.

Outlining the Worksheet

Before you begin to enter information on the Multiplan worksheet, take a moment to jot down an outline of how you want your worksheet to look.



This is a good outline to begin with—now, start creating your Multiplan worksheet.

Entering Text: The Alpha Command

If you have not already done so, start Multiplan.

To start Multiplan

► At the system prompt, type **mp** and press Enter.

Multiplan opens a new worksheet named TEMP.

Now you are ready to enter text. You enter text and numbers in different ways. Multiplan recognizes numbers as soon as you type them. However, when you want to enter text, you must tell Multiplan by choosing the Alpha command.

First, enter the headings for the rows.

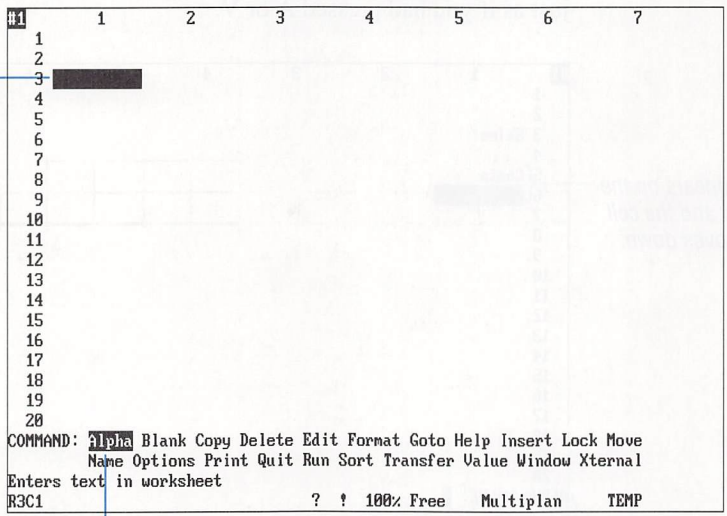
To label the rows

1. Move the cell pointer to row 1, column 1 (R1C1) if it is not already there.

   You can use the direction keys, or press Home.

2. Press the Down Arrow key twice to move the cell pointer to R3C1.

   Now you have room for the column headings that you will enter later. The command line shows that the Alpha command is the active command.



3. Press Enter to choose the active command, Alpha.
4. Type **Sales** and press Enter.

   If you make a mistake while typing, press Backspace.

Entering Text with the Direction Keys

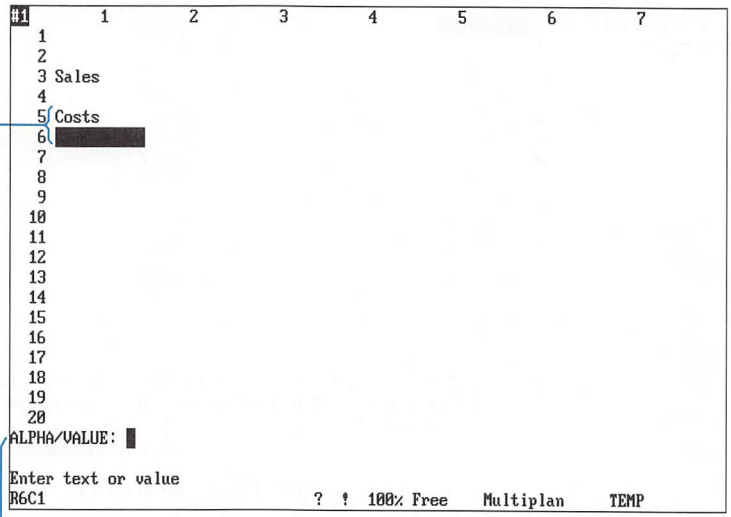
Now enter the second heading, "Costs."

To enter "Costs"

1. Move the cell pointer to R5C1.
2. Choose the Alpha command by pressing A.
3. Type **Costs** but do not press Enter.
4. Press the Down Arrow key.

Pressing a direction key instead of Enter enters the information you have typed and moves the cell pointer to the next cell at the same time. The next key you press automatically chooses either the Alpha command or the Value command, just as if you had pressed A or V.

"Costs" appears on the worksheet and the cell pointer moves down.



Multiplan choses either Alpha or Value depending on the next key you press.

Multiplan selects the Value command if you type any digit (0 through 9) or one of these characters:

= + - . ("

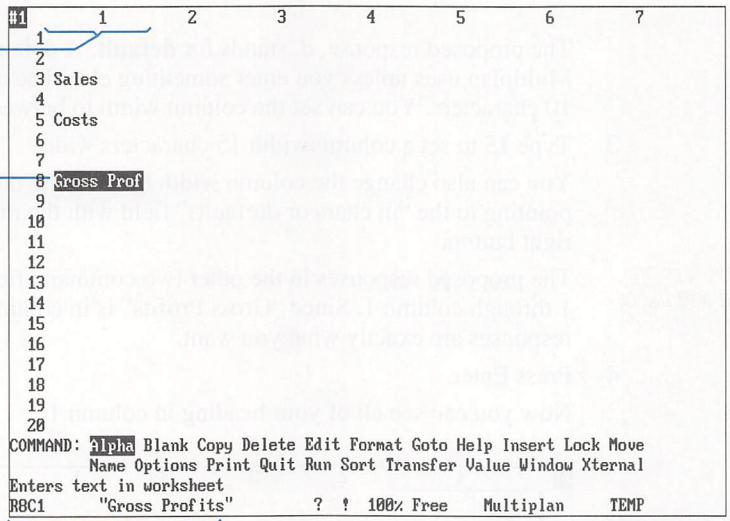
If you type any other character, Multiplan selects the Alpha command.

To enter "Gross Profits"

1. Press the Down Arrow key twice to move the cell pointer to R8C1.
2. Type **Gross Profits**

   As soon as you begin to type, Multiplan automatically selects the Alpha command, and the message line changes from *Enter text or value* to *Enter text*.
3. Press Enter.

   "Gross Profits" is entered in R8C1, but not all of the heading shows. You need to widen the column.



Changing Column Width

Multiplan displays as much of your information as it can in the space available. When you start Multiplan, the column width is set to 10 characters. You can change the column width by choosing the Format Width command.

To change the column width

1 Choose Format by pressing F.

Multiplan displays the Format command menu on the command line.

2 Choose Width by pressing W.

Multiplan displays the command fields for the Format Width command.

```
FORMAT WIDTH in chars or d(efault): d   column: 1    through: 1

Enter number, or d for default
R8C1      "Gross Profits"          ? !  100% Free    Multiplan     TEMP
```

The proposed response, d, stands for **default**. A default is a response that Multiplan uses unless you enter something else. The default column width is 10 characters. You can set the column width to between 0 and 64 characters.

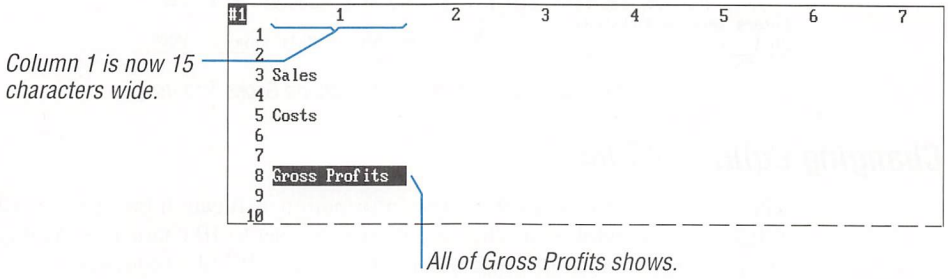
3 Type **15** to set a column width 15 characters wide.

You can also change the column width by pressing the direction keys or by pointing to the "in chars or d(efault)" field with the mouse and pressing the right button.

The proposed responses in the other two command fields would widen column 1 through column 1. Since "Gross Profits" is in column 1, these proposed responses are exactly what you want.

4 Press Enter.

Now you can see all of your heading in column 1.



For more information on changing column width, see "Format Width" and "Format Default Width" in Chapter 13, "Commands."

Entering Text and Scrolling

Now that you have labeled some of the rows, you need to label the columns.

To label the columns

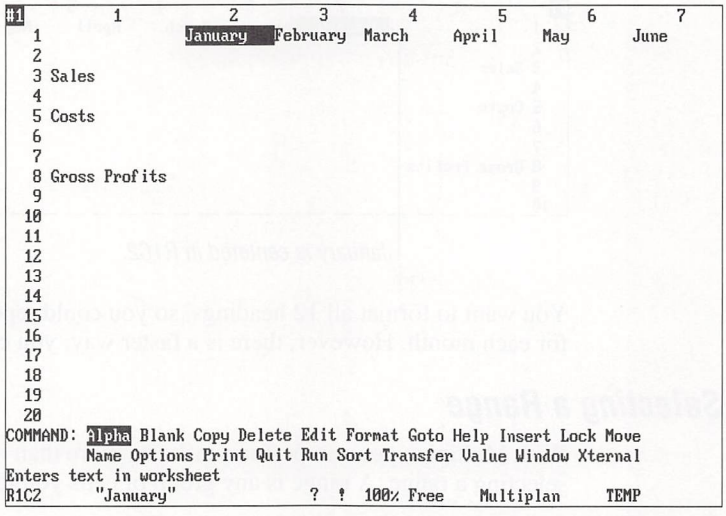
1. Move the cell pointer to R1C2.
2. Choose Alpha by pressing A.
3. Type **January**
4. Press the Right Arrow key to move the cell pointer to the right (R1C3).

   Remember that moving the cell pointer with the direction keys enters the text and chooses the Alpha/Value command.
5. Follow the same procedure until you have entered all of the months in cells R1C2 through R1C13.

   Multiplan automatically scrolls through the worksheet as you move the cell pointer.
6. Press Enter after typing **December** in cell R1C13.

   Multiplan returns you to the main menu.
7. Move the cell pointer back to January (R1C2).

   Your screen should look like this:



Centering Text: The Format Cells Command

The worksheet would be easier to read if the names of the months were centered over the columns.

To center the headings

1. Choose Format by pressing F.
2. Choose Cells by pressing C.

```
FORMAT cells: R1C2              alignment:(Def)Ctr Gen Left Right -
     format: Default
Enter reference to cell or group of cells
R1C2      "January"             ? ! 100% Free    Multiplan     TEMP
```

In the first command field, the proposed cell, R1C2, is the one you want to center.

3. Press Tab to move the cursor to the "alignment" field.
4. Press C to select Ctr (for "center").
5. Press Enter.

Multiplan centers the word "January" in the cell.

```
#1        1         2         3         4         5         6         7
  1               January  February  March     April     May       June
  2
  3 Sales
  4
  5 Costs
  6
  7
  8 Gross Profits
  9
 10
```

January is centered in R1C2.

You want to format all 12 headings, so you could repeat the preceding procedure for each month. However, there is a faster way; you can select a range.

Selecting a Range

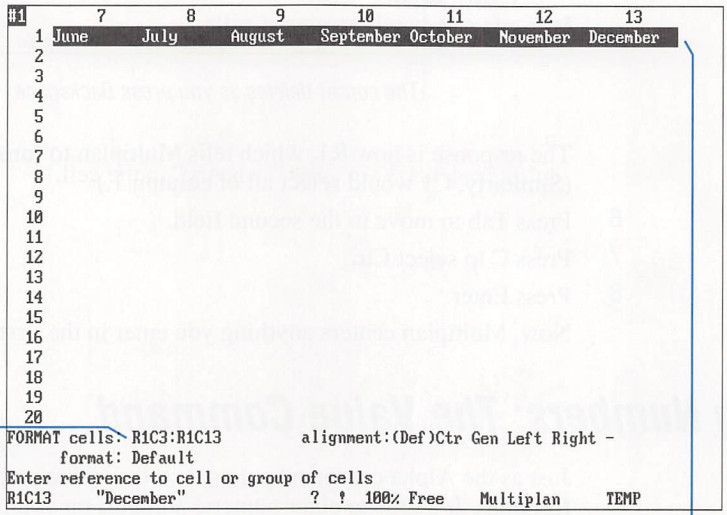
With Multiplan you can perform tasks on more than one cell at a time by selecting a range. A range is any group of cells you identify to Multiplan.

To select February through December as a range

1. Move the cell pointer to February (R1C3).
2. Choose Format by pressing F.
3. Choose Cells by pressing C.
4. Type : (a colon).

   Notice that R1C3 in the "cells" field is not replaced, but that a colon is added to the end of the response.
5. Press the Right Arrow key until the cell pointer is in column 13 (R1C13).

   Notice that the cell pointer does not switch from one cell to the next; instead, it extends to cover all the cells that it passes through. The response in the "cells" field also displays the range of cells you want to change as you move the cell pointer.



The response in the "cells" field changes to show the range.

The cell pointer expands to cover the range of cells.

6. Press Tab.

   Multiplan moves the screen back to show the cell at the beginning of the range.
7. Press C to select Ctr.
8. Press Enter.

   Multiplan centers the headings on the screen.

   You have just centered the headings in the first row. Since you'll be adding more headings to the first row later, you want all future headings in this row to be centered, too.

To center headings automatically

1. Move the cell pointer to R1C2.
2. Choose Format by pressing F.
3. Choose Cells by pressing C.
4. Press F10 to move the cursor to the end of the proposed response in the first field.

   Before, you pressed the Right Arrow key to create a range. But this time you want to format a whole row, and pressing the Right Arrow key would take too long. You could type the range in yourself (1:255), but there is a more efficient way: delete C2 from the cell reference, leaving R1.
5. Press Backspace twice.

```
FORMAT cells: R1                alignment: Def(Ctr)Gen Left Right -
     format: Default
Enter reference to cell or group of cells
R1C2      "January"              ? ! 100% Free    Multiplan     TEMP
```

The cursor deletes as you press Backspace.

   The response is now R1, which tells Multiplan to format all of row 1. (Similarly, C1 would select all of column 1.)
6. Press Tab to move to the second field.
7. Press C to select Ctr.
8. Press Enter.

   Now, Multiplan centers anything you enter in the first row.

Entering Numbers: The Value Command

Just as the Alpha command enters text, the Value command enters numbers and formulas. It's time to enter numeric amounts on your worksheet. The first amounts are monthly sales and costs. The sales figures for Spencer Ceramics show that the average monthly sales last year were $20,000, and the average costs were $15,000. In projecting financial activity for the new year, you decide to start with these amounts. You will update them later.

To enter the monthly sales and costs

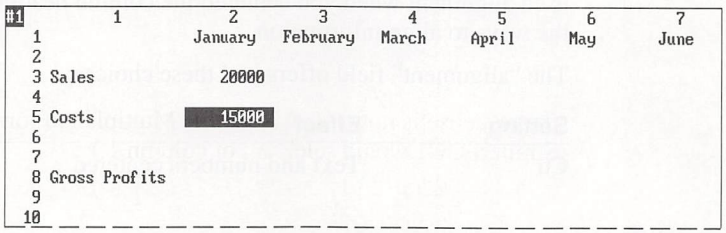
1. Move the cell pointer to R3C2, next to Sales.
2. Type **20000**

   As soon as you type a digit from 0 to 9, Multiplan automatically selects the Value command.

   When you enter numbers, do not use commas (20,000) or spaces (20 000) or dollar signs ($). Fill in all the figures first. You'll learn how to change the format later.
3. Press the Down Arrow key twice.

   The amount you typed is entered in cell R3C2; the cell pointer moves to R5C2, and the Alpha/Value command appears.

   Costs for Spencer Ceramics were $15,000 per month.
4. Type **15000** and press Enter.



Since all the figures you are working with on this project have to do with finances, you may decide that it would be better to have all the numbers displayed as dollars.

Displaying Information: The Format Default Cells Command

Multiplan offers many different formats for displaying cell entries. You specify formats with the Format Cells and Format Default Cells commands. The Format commands control how information is aligned within the cell and how it is displayed on the screen. The Format Default Cells command changes the format of cells that have the Default format setting. Changing the format of cells does not alter their contents, but only how those contents are displayed.

To set the alignment

1 Choose Format by pressing F.

You want to change the format of all cells, so you should choose Default.

2 Choose Default by pressing D.

3 Choose Cells by pressing C.

Now you see two command fields.

```
FORMAT DEFAULT CELLS alignment: Ctr Gen Left Right
       format: General
Select option
R5C2     15000                ? ! 100% Free    Multiplan     TEMP
```

In the first field, you set the **alignment**. Alignment determines where Multiplan displays text and numbers in a cell: aligned with the left edge, aligned with the right edge, centered, or a mix of right and left alignment called "general." You used alignment when you centered the column headings; you can now see all of the ways to align information.

The "alignment" field offers you these choices:

Setting	Effect	Example
Ctr	Text and numbers centered	Sales 1000.25 50.25
Gen	Text aligned left Numbers aligned right	Sales 1000.25 50.25
Left	Text and numbers aligned left	Sales 1000.25 50.25
Right	Text and numbers aligned right	Sales 1000.25 50.25

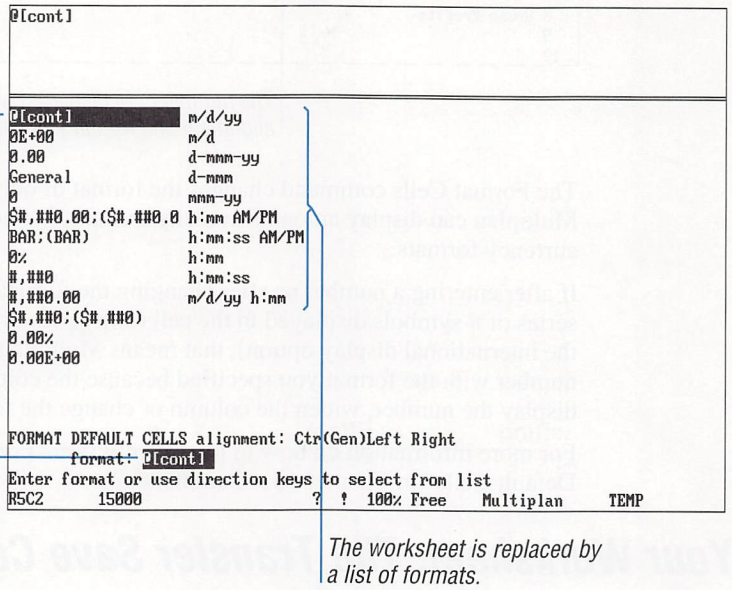
For your worksheet, any alignment choice that aligns the numbers to the right would be acceptable for your dollar amounts. You could choose Gen (general) or Right with the same effect on the numbers. However, because Right affects all cells, including column 1, all text on the worksheet would be moved to the right as well. Because you want to move only numbers to the right, you should choose Gen. The proposed response is already Gen, so you can move to the second field to select a format.

To select a format

1 Press Tab to move to the "format" field.

2 Press a direction key.

Multiplan displays a list of the available formats.



The format you select with the cursor appears in the "format" field.

The worksheet is replaced by a list of formats.

The list provides several choices for how Multiplan displays the cell contents on the worksheet. The cell contents are what is actually in the cell. The format you select is displayed in full at the top of the screen.

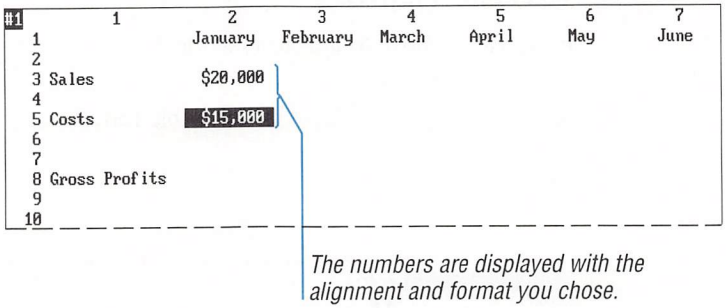
You can change the way information is displayed any time you like without changing the cell contents. For example, you could display the value "3" as 3, 3E+00, $3.00, 300%, or even ***, depending on the format option you select. For more information on what effect the choices in the list have, see "Format Cells" in Chapter 13, "Commands."

You want to format your numbers as dollars but without cents.

3 Press the Down Arrow key until you highlight the currency format "$#,##0;($#,##0)".

4 Press Enter.

Multiplan formats the cells.



The Format Cells command changes the format of only the cells you select. Multiplan can display amounts in many formats, including several international currency formats.

If after entering a number or after changing the format of a number you see a series of # symbols displayed in the cell (or a series of ! symbols if you're using the international display option), that means Multiplan is unable to display the number with the format you specified because the column is too narrow. To display the number, widen the column or change the format.

For more information on how to format cells, see "Format Cells" and "Format Default Cells" in Chapter 13, "Commands."

Saving Your Worksheet: The Transfer Save Command

You've done a lot with your worksheet. It's a good idea to save your worksheet regularly to avoid losing data. You can save your worksheet at any time using the Transfer Save command.

To save your worksheet

1. Choose Transfer by pressing T.
2. Choose Save by pressing S.

   Because you have not named your worksheet yet, Multiplan proposes the name TEMP. You want to give your worksheet a meaningful name, one that is easy to remember when you want to load the worksheet back into Multiplan.
3. Type **spencer**
4. Press Enter.

   Multiplan saves the worksheet with the filename SPENCER.

Adding Information: The Insert Command

Now you want to add information to show more detail. The worksheet should show a breakdown of monthly costs for Spencer Ceramics. According to Spencer's records, last year the average monthly costs for labor, material, and overhead were:

Labor	=	$7,000
Material	=	$4,000
Overhead	=	$4,000
Total Costs	=	$15,000

You want to add this information to the worksheet. It looks like you can place it below Costs if you add more space between Costs and Gross Profits. To insert empty rows or empty columns, choose the Insert command.

To insert new rows

1. Move the cell pointer to R6C2.
2. Choose Insert by pressing I.
3. Choose Row by pressing Enter.

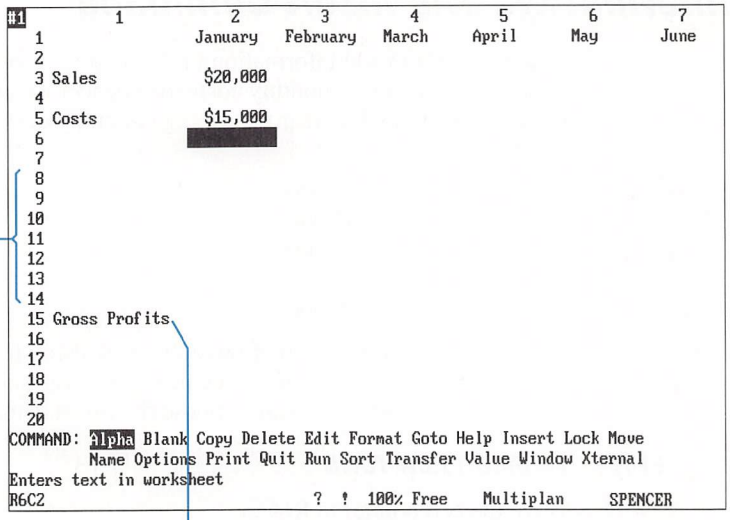
   Notice that the proposed responses are based on the position of the cell pointer. Because the cell pointer is now at row 6, Multiplan proposes the insertion of one row of space before row 6, between column 1 and column 255; in other words, one row of space across the entire worksheet.

   However, the new figures require at least five rows (three for figures, one for the total line, and one for the total costs). Allow yourself enough room by adding seven rows.
4. Type 7 in the "# of rows" field.

   In the "before row" field, you tell Multiplan where to insert the new rows. You need to insert space between row 5 and row 8. You could put the new rows before row 6 or 7 or 8. Since the proposed response of row 6 is right, you don't need to change it.

   Multiplan also proposes that you insert the new rows of space across all of the columns in the worksheet (between columns 1 and 255). Since you want the space to extend all the way across your worksheet, you do not need to change the responses in the third or fourth fields.
5. Press Enter.

   Multiplan inserts the new rows and moves the information previously in row 8 down to row 15.



Seven blank rows are inserted.

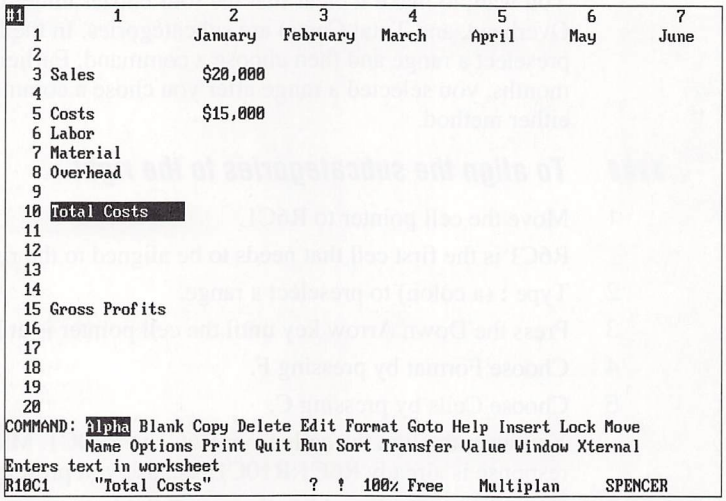
Gross Profits moves from row 8 to row 15.

To enter the cost breakdown

1. Move the cell pointer to R6C1.
2. Choose Alpha by pressing A.
3. Type **Labor** and press the Down Arrow key.
4. Type **Material** and press the Down Arrow key.
5. Type **Overhead** and press the Down Arrow key twice to move the cell pointer to row 10.
6. Type **Total Costs** and press Enter.

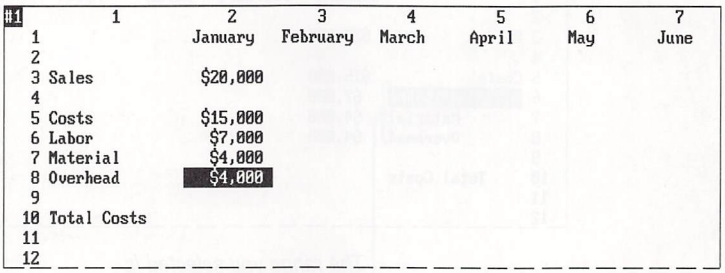
   You press Enter instead of the Down Arrow key because you have finished entering the row headings.

Now your worksheet looks like this:



To enter the additional numbers

1. Move the cell pointer to R6C2.
2. Type **7000** and press the Down Arrow key.
3. Type **4000** and press the Down Arrow key.
4. Type **4000** and press Enter.



Formatting the Inserted Information

You want to make it clear that the four entries under Costs (Labor, Material, Overhead, and Total Costs) are subcategories. In the following procedure you preselect a range and then choose a command. Earlier, when you formatted the months, you selected a range after you chose a command. You can usually use either method.

To align the subcategories to the right

1. Move the cell pointer to R6C1.

   R6C1 is the first cell that needs to be aligned to the right.

2. Type : (a colon) to preselect a range.
3. Press the Down Arrow key until the cell pointer is at R10C1.
4. Choose Format by pressing F.
5. Choose Cells by pressing C.

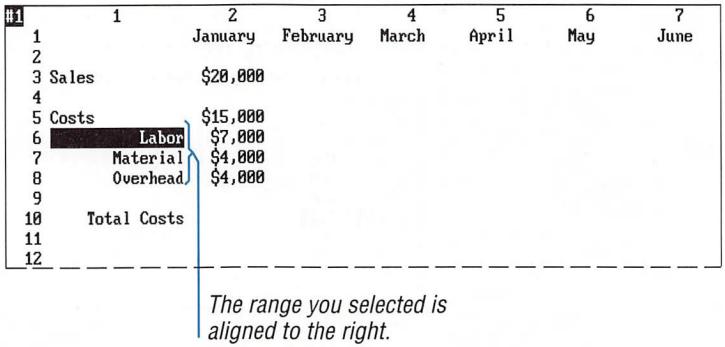
   You want to align the cells from R6C1 to R10C1. Multiplan's proposed response is already R6C1:R10C1 because you preselected this range.

6. Press Tab to move to the "alignment" field.

   You want the text to be aligned to the right.

7. Select Right by pressing R.
8. Press Enter.

Rows 6 through 10 in column 1 are now aligned to the right.



You can select a range by moving the cell pointer, or by typing the cell references in the command field. For example, instead of preselecting and moving the cell pointer, you could have typed R6C1:R10C1 in the "cells" field.

Clearing a Cell: The Blank Command

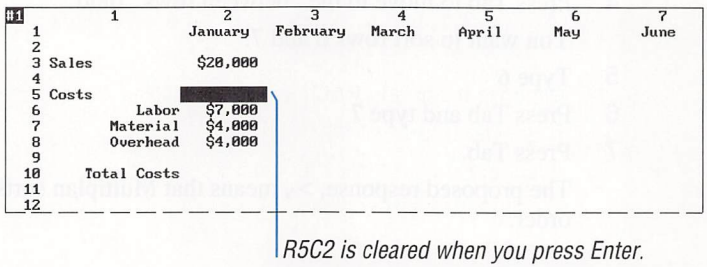
Since you can now enter the total costs in row 10, clear the value in R5C2 and use Costs as a heading.

To clear Costs

1. Move the cell pointer to R5C2.
2. Choose Blank by pressing B.

   Look at the proposed response in the "cells" field. The proposed response is based on the active cell, currently R5C2 (the cell you want to clear).
3. Press Enter.

   Multiplan clears the contents of R5C2.



If you need to clear a group of cells, you can choose Blank and then select a range, or you can preselect a range and then choose Blank.

WARNING When you are using the Blank command, always check to be sure the cell or range of cells you select is the one you want to clear before you press Enter.

Sorting Information: The Sort Command

With Multiplan you can sort rows and columns by choosing either the Sort Rows or the Sort Columns command.

Suppose you want to place the information about Material immediately under Costs on the SPENCER worksheet. You could exchange the positions of the rows by choosing either the Move command or the Sort command. You will learn about the Move command later, so sort rows 6 and 7 by choosing the Sort Rows command.

When you choose the Sort Rows command, Multiplan reorders rows on the worksheet using the column or columns you specify as the **sort key**. A sort key tells Multiplan what information to examine in order to decide whether a row (or column) should precede or follow another.

If you specify column 2, which contains numeric amounts, as a sort key, Multiplan compares $7,000 to $4,000 to determine the new positions of the rows. (You could also use column 1 as a sort key and Multiplan would sort based on the alphabetic order of the names.) You can have Multiplan sort in ascending order (>) or descending order (<). Since you want Material ($4,000) to precede Labor ($7,000), you must sort in ascending order.

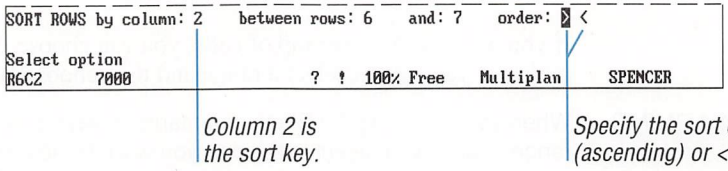
To sort rows

1. Move the cell pointer to R6C2.
2. Choose Sort by pressing S.
3. Choose Rows by pressing R.

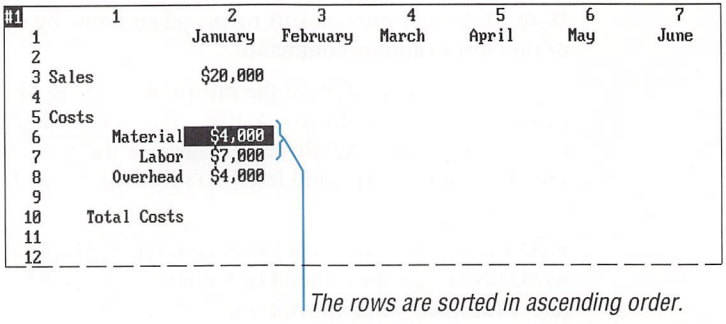
   You want to sort based on the values in column 2, so the proposed response in the "by column" field is correct.
4. Press Tab to move to the "between rows" field.

   You want to sort rows 6 and 7.
5. Type **6**
6. Press Tab and type **7**
7. Press Tab.

   The proposed response, > , means that Multiplan sorts the rows in ascending order.



8. Press Enter.



With the Sort commands you can specify several sort keys separated by commas; the first key has the highest priority, the second key the next highest priority, and so on. For more information on the different ways you can sort information, see "Sort Columns" and "Sort Rows" in Chapter 13, "Commands."

Drawing a Line

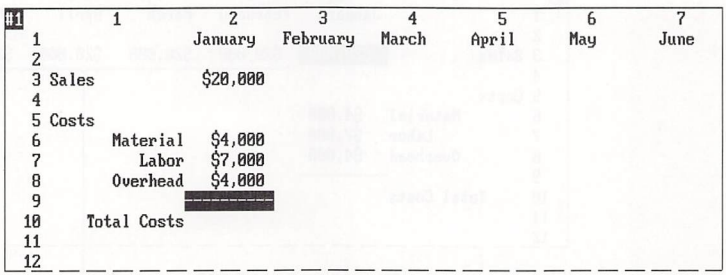
When you work with figures by hand, you draw lines to separate totals from other numbers. With Multiplan, you can add lines to the worksheet to make it easier to read.

To draw a line

1. Move the cell pointer to R9C2.
2. Choose Alpha by pressing A.
3. Type 10 hyphens.

   Because you also use the hyphen as a minus sign, if you tried to enter the hyphens without first choosing the Alpha command, the Value command would appear, and Multiplan would expect a negative number or a formula. If this happens, you can press Esc and start the procedure again.
4. Press Enter.

   The hyphens appear as a line in R9C2.



#1	1	2	3	4	5	6	7
1		January	February	March	April	May	June
2							
3	Sales	$20,000					
4							
5	Costs						
6	Material	$4,000					
7	Labor	$7,000					
8	Overhead	$4,000					
9		----------					
10	Total Costs						
11							
12							

At the end of the next section, you will learn how to extend this line across as many columns as you want.

Copying Information: The Copy Command

When you copy a cell, you usually copy all the information for that cell. This includes the text or value in the cell, the formula for the cell, any format assigned to the cell, and so on. With the Copy command, you can copy just the formulas, just the values, or just the formats. Width, however, is not copied from cell to cell because width is related to the column the cell is in, not to the cell itself.

The figures you entered for Spencer Ceramics were for one month only. You want to project figures for the rest of the year based on last year's average monthly performance. Start by copying the figures you have for January into the remaining months of the year (the next 11 columns). Later, you will change figures for each month to see the effects on profits.

To copy Sales ($20,000)

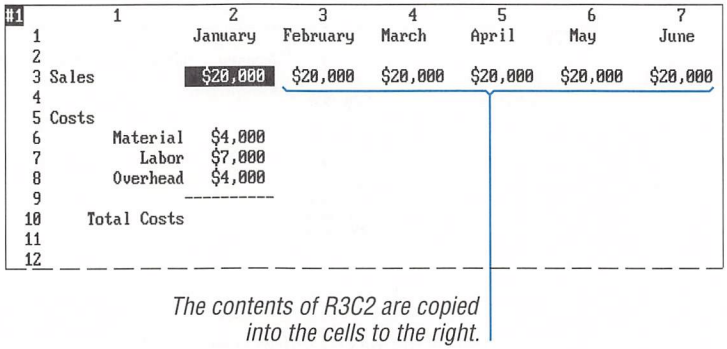
1. Move the cell pointer to R3C2.
2. Choose Copy by pressing C.

   You want to copy from R3C2 into the cells to the right of R3C2.
3. Choose Right by pressing R.

   Remember, since Right is the active command, you can also choose it by pressing Enter.

   You want to copy the value of R3C2 eleven times (from February to December).
4. Type **11**

   Multiplan's proposed response in the "starting at" field is the location of the active cell. This is the cell you want to copy. You want to copy all of the cell's attributes, so the "copy" field is already set correctly, too.
5. Press Enter.



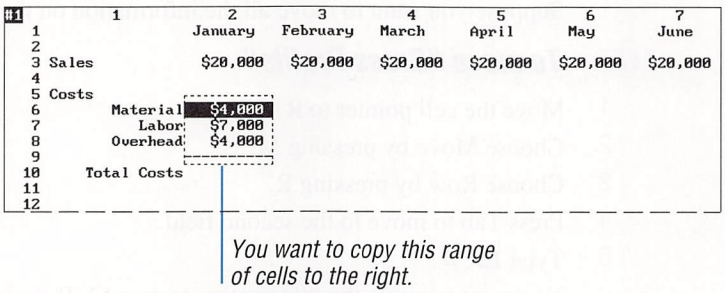
The screen is too small to display all 12 months at one time, but you can use the direction keys to scroll through the worksheet. Scroll until both column 13 and column 14 are visible. The sales figures stop at column 13 (the end of the year).

You know that material, labor, and overhead will not remain constant in the new year, but last year's average monthly figures are good ones to start with since you anticipate no major changes. Now fill in the projected cost figures again by using the Copy command. Instead of copying one row at a time (as you did when you copied the $20,000 for Sales), choose the Copy Right command to copy a group of cells.

To copy a group of cells

1 Move the cell pointer to R6C2.

You want to copy the information from rows 6 through 9 in column 2, to the same rows in columns 3 through 13.



	1	2	3	4	5	6	7
1		January	February	March	April	May	June
2							
3	Sales	$20,000	$20,000	$20,000	$20,000	$20,000	$20,000
4							
5	Costs						
6	Material	$4,000					
7	Labor	$7,000					
8	Overhead	$4,000					
9							
10	Total Costs						
11							
12							

You want to copy this range of cells to the right.

2 Choose Copy by pressing C.

3 Choose Right by pressing R.

Notice that the "number of cells" field shows the same number you typed the last time you used the Copy Right command. Since you want to copy the same number of fields, you don't need to change the proposed response.

4 Press Tab to move to the "starting at" field.

If you were copying only one row, the proposed response would be correct. But you want to copy four rows of column 2 to the right, so you need to select a range.

5 Type : (a colon) to select a range.

6 Press the Down Arrow key until the cell pointer is on R9C2.

7 Press Enter.

	1	2	3	4	5	6	7
1		January	February	March	April	May	June
2							
3	Sales	$20,000	$20,000	$20,000	$20,000	$20,000	$20,000
4							
5	Costs						
6	Material	$4,000	$4,000	$4,000	$4,000	$4,000	$4,000
7	Labor	$7,000	$7,000	$7,000	$7,000	$7,000	$7,000
8	Overhead	$4,000	$4,000	$4,000	$4,000	$4,000	$4,000
9							
10	Total Costs						
11							
12							

Only columns 1 through 7 are visible, but you can scroll through the worksheet to display the other columns.

Moving Information: The Move Command

You can use the Move command to move entire rows or columns to a new position on the worksheet. The Move command reorganizes rows or columns, while the Insert command adds space between rows or columns.

Suppose you want to move all the information on the worksheet closer together.

To move "Gross Profits"

1. Move the cell pointer to R15C1.
2. Choose Move by pressing M.
3. Choose Row by pressing R.
4. Press Tab to move to the second field.
5. Type **12**

   You want to move the information to row 12. If there was any information in this row, it, and any information in the rows below it, would be moved down.

   You want to move only one row, so the "# of rows" field is correct.
6. Press Enter.

   Gross Profits moves to row 12.

```
#1          1          2          3          4          5          6          7
  1                  January    February   March      April      May        June
  2
  3 Sales            $20,000    $20,000    $20,000    $20,000    $20,000    $20,000
  4
  5 Costs
  6        Material  $4,000     $4,000     $4,000     $4,000     $4,000     $4,000
  7           Labor  $7,000     $7,000     $7,000     $7,000     $7,000     $7,000
  8        Overhead  $4,000     $4,000     $4,000     $4,000     $4,000     $4,000
  9
 10     Total Costs
 11
 12 Gross Profits
 13
 14
 15
 16
 17
 18
 19
 20
COMMAND: Alpha Blank Copy Delete Edit Format Goto Help Insert Lock Move
         Name Options Print Quit Run Sort Transfer Value Window Xternal
Enters text in worksheet
R15C1                              ?  !  100% Free    Multiplan     SPENCER
```

The Move command moves an entire row or column at a time, not just part of it.

Printing a Worksheet

Chapter 3 explains printing in more detail, but you might like to print what you've done so far. Before you can print, your printer must be properly set up. For more information, see your printer manual and Appendix B, "Using PRD Files and Advanced Printing Features."

To print your worksheet

1. Make sure your printer is connected properly and ready to print.
2. Choose Print by pressing P.
3. Choose Printer by pressing P.

   Multiplan starts printing the worksheet.

   If you want to stop printing before Multiplan has printed all of the worksheet, press Esc. Multiplan stops printing and returns you to the main command menu.

Saving a Worksheet: A Review

If you want to take a break before going on to the next chapter, save your worksheet by choosing the Transfer Save command and then quit Multiplan. Later, you can start Multiplan and load the worksheet by choosing the Transfer Load command.

IMPORTANT You should save your worksheet often to avoid accidentally losing data. You can save your worksheet at any time.

To save your worksheet

1. Choose Transfer by pressing T.
2. Choose Save by pressing S.
3. Press Enter to accept the name SPENCER that you entered earlier.

   When you save a worksheet with the name of a file that already exists, Multiplan asks you if you want to overwrite the existing file. If you do not want to overwrite the information, press Esc. In this case you want to overwrite the existing SPENCER worksheet, so all the new work you just finished will be saved.
4. Press Y to overwrite the existing file with the information you have added.

   Multiplan saves the worksheet and names it SPENCER.

   If you want to stop for now, you can exit Multiplan.

To exit Multiplan

► Choose Quit by pressing Q.

Multiplan clears the screen and returns you to the system prompt.

2 Using Formulas

In Chapter 1, you created a basic worksheet for Spencer Ceramics. In this chapter, you will expand your worksheet and begin to use formulas to do calculations. You will learn how to:

- Build a formula.
- Use functions in formulas.
- Name cells and place the names in formulas.
- Resolve error values.
- Use absolute and relative cell references.
- Copy a formula.
- Use percentages in a formula.
- Protect information by locking formulas and cells.
- Make changes more quickly by turning off automatic recalculation.

Your SPENCER worksheet shows estimates for projected sales and costs for the new year. With this information, you can build a **formula** to calculate the total costs and gross profits. A formula calculates values using standard mathematical operations in combination with the information on the worksheet.

Building a Formula

You want to enter a formula for calculating total costs. Multiplan will calculate the total costs in row 10 by adding the three rows above it.

First, start Multiplan and load the SPENCER worksheet you completed in Chapter 1, if it is not already loaded.

To start Multiplan and load the SPENCER worksheet

1. Type **mp** and press Enter to start Multiplan.
2. Choose Transfer by pressing T.
3. Choose Load by pressing L.

   Multiplan prompts you to enter a filename.
4. Type **spencer** (the name of the worksheet you want to load) and press Enter.

   Multiplan loads the SPENCER worksheet.

NOTE If you forget the name of the worksheet you want to load, press any direction key while the cursor is in the "filename" field. Multiplan displays a list of all the files in the current directory. Use the direction keys to select the name of the worksheet you want and press Enter to load the worksheet.

Now you are ready to actually build the formula. You might be tempted not to bother with a formula. After all, you can easily add the three numbers yourself. However, costs may change during the year—you need a formula that works for other months so that you don't have to recalculate costs every time.

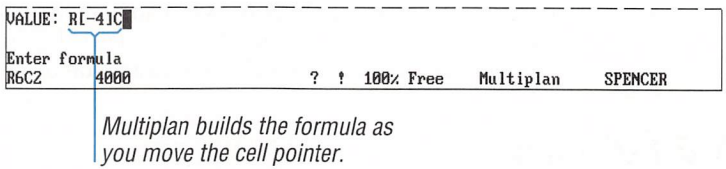
Think about how you would calculate total costs. You would say to yourself, "Total Costs equals Material plus Labor plus Overhead," or, in terms of your worksheet, "row 10 equals row 6 plus row 7 plus row 8." This is exactly how you build the formula with Multiplan.

To build the formula for Total Costs

1. Move the cell pointer to R10C2, next to Total Costs.
2. Press = (an equal sign).

   The equal sign does not appear in the command line, but it signals Multiplan to begin a formula, and activates the Value command.
3. Move the cell pointer to R6C2.

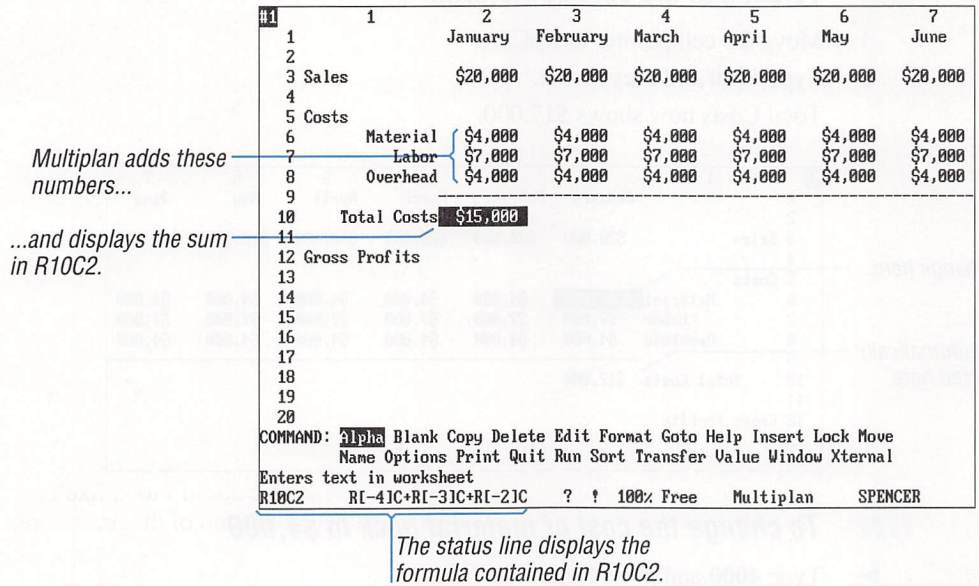
   The formula you see being built in the command line doesn't look like the formula you thought of, but it will be explained at the end of the procedure.



Multiplan builds the formula as you move the cell pointer.

4. Type +
5. Move the cell pointer to R7C2.
6. Type +
7. Move the cell pointer to R8C2.
8. Press Enter.

   Multiplan calculates the total costs—$15,000 appears in R10C2 next to Total Costs.




```
#1        1          2          3          4          5          6          7
  1                 January    February   March      April      May        June
  2
  3 Sales           $20,000    $20,000    $20,000    $20,000    $20,000    $20,000
  4
  5 Costs
  6       Material  $4,000     $4,000     $4,000     $4,000     $4,000     $4,000
  7         Labor   $7,000     $7,000     $7,000     $7,000     $7,000     $7,000
  8       Overhead  $4,000     $4,000     $4,000     $4,000     $4,000     $4,000
  9                 ---------------------------------------------------------------
 10    Total Costs  $15,000
 11
 12 Gross Profits
 13
 14
 15
 16
 17
 18
 19
 20
COMMAND: Alpha Blank Copy Delete Edit Format Goto Help Insert Lock Move
         Name Options Print Quit Run Sort Transfer Value Window Xternal
Enters text in worksheet
R10C2     R[-4]C+R[-3]C+R[-2]C    ?  !  100% Free     Multiplan     SPENCER
```

The dollar format you selected earlier with the Format Default Cells command automatically displays the total as dollars. Because you changed the default setting, any numbers you enter appear as dollars unless you specifically change them with the Format Cells command.

Multiplan used the formula to calculate the value of R10C2 this way:

Formula shows	Formula means
R[-4]C	the contents of the cell 4 rows up from the active cell...
+	plus...
R[-3]C	the contents of the cell 3 rows up from the active cell...
+	plus...
R[-2]C	the contents of the cell 2 rows up from the active cell

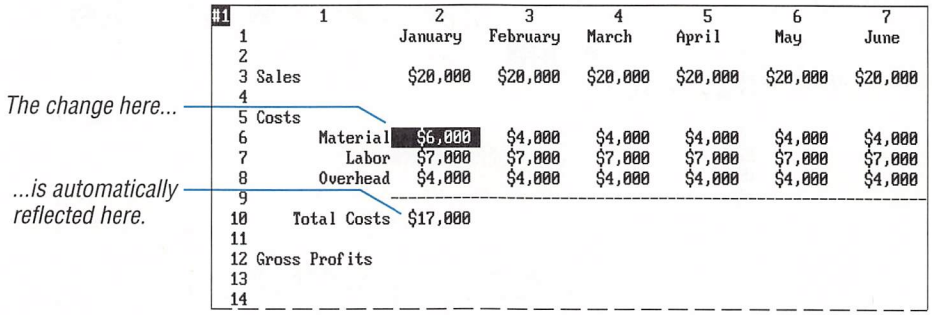
Row and column references written with square brackets enclosing a number (or parentheses enclosing a number if you are using the international display option) are called **relative references**. You will learn more about relative references later in this chapter.

NOTE In Multiplan, when a formula does not specify a row or column number, it refers to the active row or column.

To change the cost of material

1. Move the cell pointer to R6C2.
2. Type **6000** and press Enter.

   Total Costs now shows $17,000.



To change the cost of material back to $4,000

- Type **4000** and press Enter.

  Watch Total Costs change back to $15,000.

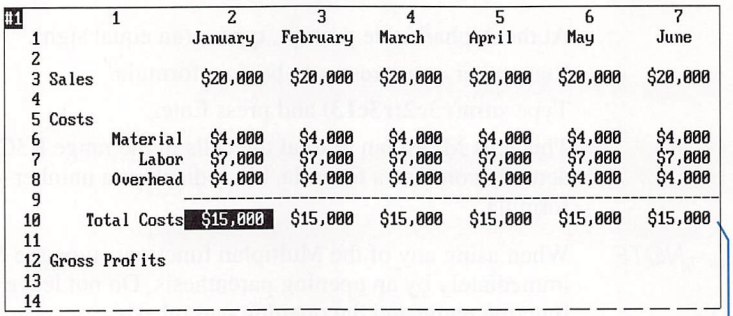
Copying a Formula

You have built a formula to calculate projected total costs for the month of January. Now you can copy the formula to calculate total costs for the other months, too.

To copy the Total Costs formula to the right

1. Move the cell pointer to R10C2.
2. Choose Copy by pressing C.
3. Choose Right by pressing R.
4. Type **11**

   The "copy" field tells Multiplan what information in the cell to copy. You could set this field to Formula, but it's easier just to leave it set to All because copying all the cell's contents includes the formula.
5. Press Enter.



#1	1	2	3	4	5	6	7
1		January	February	March	April	May	June
2							
3	Sales	$20,000	$20,000	$20,000	$20,000	$20,000	$20,000
4							
5	Costs						
6	Material	$4,000	$4,000	$4,000	$4,000	$4,000	$4,000
7	Labor	$7,000	$7,000	$7,000	$7,000	$7,000	$7,000
8	Overhead	$4,000	$4,000	$4,000	$4,000	$4,000	$4,000
9							
10	Total Costs	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000
11							
12	Gross Profits						
13							
14							

Multiplan copies the formula to the right. Each cell contains the sum of the three cells above it.

Watch the values appear across the screen. Now you can change any of the costs, and Multiplan will update the appropriate month's total cost. With Multiplan, you can copy information in a variety of ways. For example, the Copy Down command is similar to the Copy Right command, except that you use it to copy information down the columns instead of across the rows. You will learn more about how Multiplan copies formulas later in this chapter.

Using a Function in a Formula

Now you want to project the new year's total sales. You can easily multiply 12 x $20,000 and get $240,000, but you know the sales information will change. You decide to create a new heading for the sum of all sales, and then to place a formula in the cell immediately below the heading.

To add a new heading

1. Move the cell pointer to R1C14.

   You can use the direction keys, or you can choose the Goto command.
2. Choose Alpha by pressing A.
3. Type **Sum** and press the Down Arrow key twice.

   Sum is centered in column 14 because you used the Format Cells command earlier to center the entire row.

   To calculate the sales total for Spencer Ceramics for the 12 months, you build a formula using the Multiplan SUM **function**. A function is a built-in operation that Multiplan can perform on one or more cells. You place functions within formulas. The SUM function, for example, adds the values in the list of cells you select, and calculates a total.

To enter the SUM function

1 At the Alpha/Value prompt, type = (an equal sign).

Remember, you press = to begin a formula.

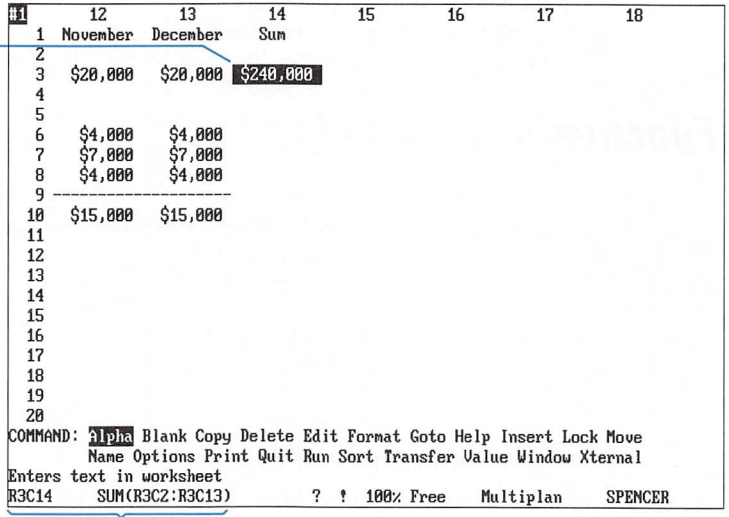
2 Type **sum(r3c2:r3c13)** and press Enter.

This tells Multiplan to total the cells in the range R3C2 to R3C13. The cell actually contains a formula, but it displays a number—the result of the formula.

NOTE When using any of the Multiplan functions, type the function name followed immediately by an opening parenthesis. Do not leave any space between the function name and the opening parenthesis.

If you forget how a particular function is spelled or if you want to save time, instead of typing it into a formula, you can press Shift+F3 at the Value prompt followed by a direction key. Multiplan displays a list of functions divided into subject categories. Move the cursor to the function you want and then type the rest of the formula as usual.

The sum of the cells in row 3 appears in R3C14.



The status line displays the function contained in R3C14.

Naming Cells: The Name Command

You **name** a cell or group of cells to show that they are related and to make it easy to refer to them.

To build the formula for Gross Profits, you will name the groups of cells that contain sales and total cost figures. You can then use these names in your formula. Remember, gross profits equals sales minus total costs.

You can name the part of row 3 that contains the sales figures "Sales." (You would not want to name all of row 3 "Sales" because R3C14 does not contain sales information for a specific month.) With Multiplan, you can name any range of cells.

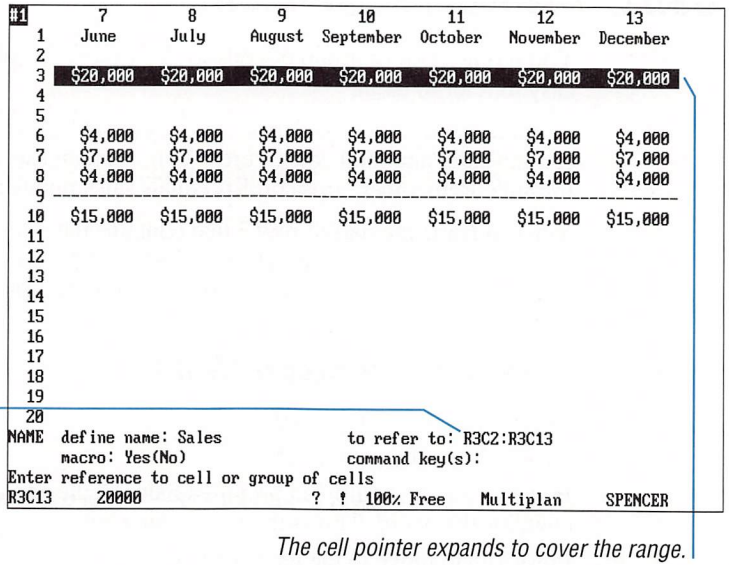
To name a range of cells "Sales"

1. Move the cell pointer to R3C1.
2. Choose Name by pressing N.

   In the first field, Multiplan proposes Sales as the name because the active cell contains that word. This is the name you want.
3. Press Tab to move to the next field.

   Notice that when you move to the "to refer to" field, the message changes to *Enter reference to cell or group of cells*. Multiplan is asking you to select the range of cells that Sales refers to.
4. Press the Right Arrow key.

   The response in the "to refer to" field is now R3C2, but you want Sales to refer to the cells in row 3, columns 2 through 13.
5. Type **:** (a colon) to select a range.
6. Press the Right Arrow key to move the cell pointer to column 13.



Multiplan builds the range as you move the cell pointer.

The cell pointer expands to cover the range.

7 Press Enter.

The range R3C2:R3C13 is now named Sales.

NOTE If you want, you can type the cell reference after the colon instead of using the cell pointer. This method may be faster if you know the reference of the last cell in the group.

To name a range of cells "Total Costs"

1 Move the cell pointer to R10C1.

2 Choose Name by pressing N.

Notice that the proposed response in the "define name" field is Total_Costs and the proposed response in the "to refer to" field is R10C2:13. These responses are correct.

3 Press Enter.

The range R10C2:R10C13 is now named Total Costs.

Multiplan does not distinguish between uppercase and lowercase characters in names, so "sales" and "Sales" and "SALES" are all the same name. Names must be one word, without spaces or hyphens. When you define text on the worksheet as a name, Multiplan changes any spaces to underlines and deletes any illegal characters (such as $, #, *, and so on) when the name appears in the command line. This does not affect the appearance of text on the worksheet.

Using Names in Formulas

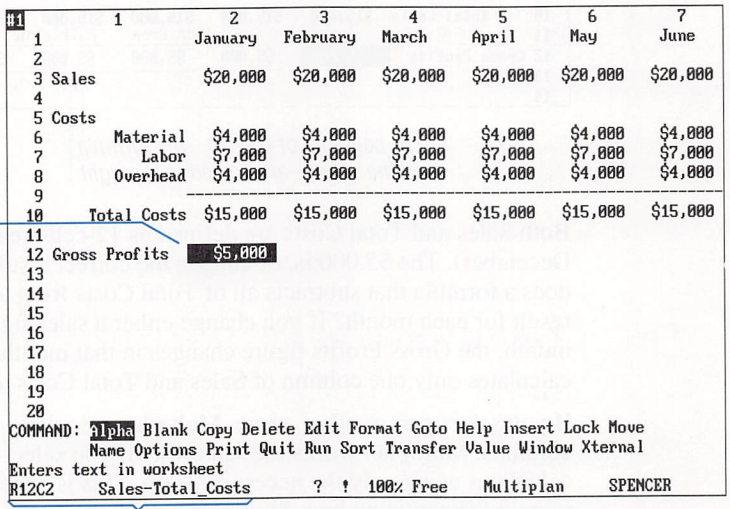
Names do not appear on the screen, but you can use them like any reference. For example, you can use names anywhere you can use a range.

When you use names in formulas, it is easy to see how the cells relate to each other. Now that you have named Sales and Total Costs, you can calculate Gross Profits. For this example, use the formula "Gross_Profits = Sales – Total_Costs."

To calculate Gross Profits using names

1. Move the cell pointer to R12C2.
2. Press = (an equal sign) to start a formula.
3. Type **sales–total_costs** and press Enter.

   Gross Profits (R12C2) now shows $5,000, and the status line displays the Gross Profits formula.



The value appears in R12C2.

The status line displays the formula contained in R12C2.

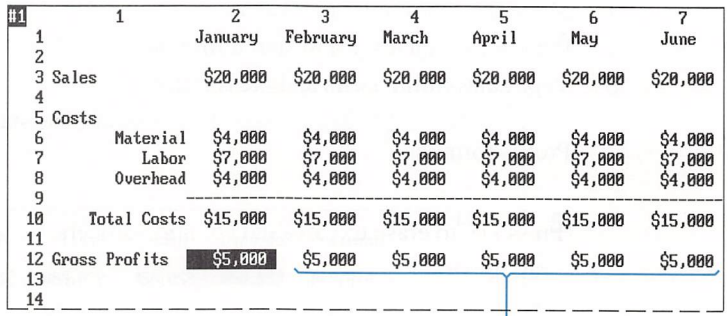
NOTE If you forget a previously defined name or if the name is very long, instead of typing it into a formula, you can press F3 at the Value prompt followed by a direction key. Multiplan displays a list of names. Move the cursor to the name you want and then type the rest of the formula as usual.

You can use the same formula you typed in R12C2 to calculate Gross Profits for each month. Rather than type the formula for each month, just copy the formula to the right 11 times.

To copy the Gross Profits formula to the right

1. Choose Copy by pressing C.
2. Choose Right by pressing R.

   The "number of cells" field shows the same number you typed the last time you used the Copy Right command. Since you want to copy 11 cells to the right, the proposed response is correct.
3. Press Enter.



#1	1	2	3	4	5	6	7
1		January	February	March	April	May	June
2							
3	Sales	$20,000	$20,000	$20,000	$20,000	$20,000	$20,000
4							
5	Costs						
6	Material	$4,000	$4,000	$4,000	$4,000	$4,000	$4,000
7	Labor	$7,000	$7,000	$7,000	$7,000	$7,000	$7,000
8	Overhead	$4,000	$4,000	$4,000	$4,000	$4,000	$4,000
9							
10	Total Costs	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000
11							
12	Gross Profits	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000
13							
14							

The contents of R12C2—the formula and the value—are copied to the right.

Both Sales and Total Costs are defined as 12-cell areas (January through December). The $5,000 is, of course, the correct result for each month. But how does a formula that subtracts all of Total Costs from all of Sales give the correct result for each month? If you change either a sales figure or a cost figure for one month, the Gross Profits figure changes in that month's column only. Multiplan calculates only one column of Sales and Total Costs at a time.

If you select part or all of a row, Multiplan calculates using only the necessary columns. Multiplan works the same way if you select part or all of a column: it calculates using only the necessary rows. This is called **implicit intersection**. For more information on how Multiplan calculates, see "Formulas" in Chapter 14, "Formulas and Functions."

Resolving Error Values

If you enter a formula that Multiplan cannot calculate, the result is one of several **error values.** Error values start with a number sign (#) (there is no initial symbol for error values if you are using the international display option). There are several types of error values that can occur. For more information, see "Error Values" in Chapter 14, "Formulas and Functions."

For example, R3C14 is the sum of Sales. Delete the name Sales and see what happens.

To remove a name

1. Move the cell pointer to R3C2.
2. Choose Name by pressing N.
3. Type **Sales**
4. Press Tab.
5. Press Del to erase the row and column numbers.
6. Press Enter.

The name Sales no longer exists.

#1	1	2	3	4	5	6	7
1		January	February	March	April	May	June
2							
3	Sales	$20,000	$20,000	$20,000	$20,000	$20,000	$20,000
4							
5	Costs						
6	Material	$4,000	$4,000	$4,000	$4,000	$4,000	$4,000
7	Labor	$7,000	$7,000	$7,000	$7,000	$7,000	$7,000
8	Overhead	$4,000	$4,000	$4,000	$4,000	$4,000	$4,000
9							
10	Total Costs	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000
11							
12	Gross Profits	#NAME?	#NAME?	#NAME?	#NAME?	#NAME?	#NAME?
13							
14							

The error values show that the name "Sales" is no longer defined.

Notice what happens in row 12—the error value #NAME? appears instead of the previous values. #NAME? means that you told Multiplan to calculate with a name that isn't defined.

To correct the error

1. Choose Name by pressing N.
2. In the "define name" field, type **Sales**
3. Press Tab.

   The response in the "to refer to" field is R3C2, but you want to correct the error in row 3, columns 2 through 13.
4. Type **:13** to select the range.
5. Press Enter.

   The totals reappear in row 12, and the sum $240,000 reappears in R3C14.

Multiplan displays different error values for different types of errors:

Error	Cause
#DIV/0!	Attempting to divide by zero
#N/A	A value that is not available
#NAME?	An undefined label reference
#NULL!	Specifying an intersection of nonintersecting areas, for example, R1 R2
#NUM!	Number is too large or too small, or an illegal use of an arithmetic function; for example, SQRT(–1)
#REF!	A relative reference reaching outside the worksheet, or a reference to a deleted area
#VALUE!	Using text where a number is needed or vice versa, or using references when a value is needed

Relative and Absolute Cell References

So far, you have referred to cells in three different ways. You referred to the cell containing the SUM function as R3C14 (the cell in row 3, column 14). When you built the formula for total costs, you referred to a cell as R[–4]C (the cell four rows up from the active cell in the same column). And when you calculated gross profits as "Sales–Total_Costs," you referred to cells by names.

When you refer to cells by R3C14, R3C2:13, or similar references to specific row numbers and specific column numbers, you are using **absolute references**. An absolute reference always identifies a specific cell or group of cells. The row and column numbers in an absolute reference are like the number and street in your street address: they always identify exactly where you live, no matter where you start from. Names are a type of absolute reference, because they also refer to a specific group of cells.

When you refer to a cell by R[–4]C and similar references to the current position plus or minus a number of rows or columns, you are using **relative references**. Relative references identify a cell or group of cells based on the location of the cell containing the reference. The row and column numbers in a relative reference are like saying, "I live four houses up from John."

Both absolute and relative references identify a cell, but they do it in different ways. An absolute reference identifies a cell, regardless of the position of any other cell. A relative reference depends on another cell to identify a cell. For example, if John moved, it wouldn't affect your street address (the absolute reference), but you would no longer live four houses up from him (the relative reference). For more information on absolute and relative references, see "Cell References" in Chapter 14, "Formulas and Functions."

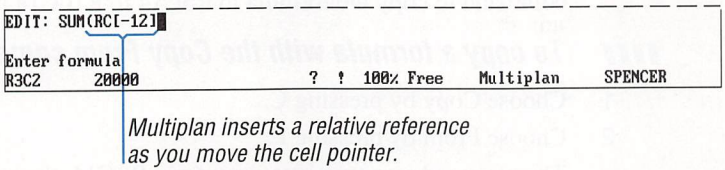
Whenever you build formulas, you should use relative references or names to give yourself the most flexibility. Use absolute references only when a formula must refer to specific cells, no matter where you copy or move the formula. For example, the formula in R3C14 currently uses an absolute reference (the name Sales). Change this formula with the Edit command to use relative references, and then use the formula for calculating the sums of Total Costs and Gross Profits.

First, you need to edit the formula in R3C14. Right now it contains the formula SUM(R3C2:R3C13). You need to change this formula so it uses relative references.

To edit the formula

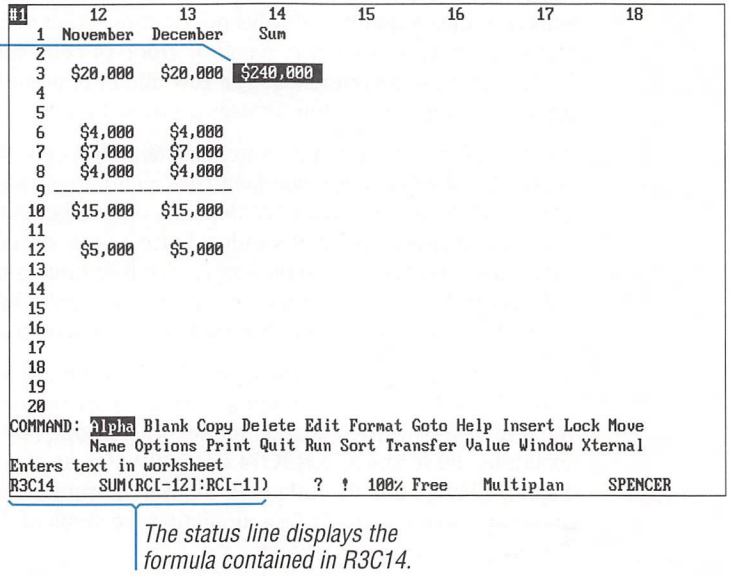
1. Move the cell pointer to R3C14.
2. Choose Edit by pressing E.
3. Press Backspace to erase R3C2:R3C13) but leave SUM(
4. Move the cell pointer to R3C2 by pressing the Left Arrow key.

   Multiplan inserts a relative reference into your formula.



Multiplan inserts a relative reference as you move the cell pointer.

5. Type : (a colon) to select a range.
6. Move the cell pointer to R3C13.
7. Type) (right parenthesis) to end the formula.
8. Press Enter.



Now you can use the same formula to calculate Total Costs and Gross Profits. You do this by copying the formula into cells R10C14 and R12C14 with the Copy From command.

Copying a Formula: The Copy From Command

The Copy From command works in much the same way as the Copy Right command, except that you can copy from any cell or group of cells to any cell or group of cells.

You need to sum Total Costs, the same way you did Sales. Use the Copy From command to copy the formula in R3C14 to R10C14 and R12C14.

To copy a formula with the Copy From command

1. Choose Copy by pressing C.
2. Choose From by pressing F.

   The proposed response is to copy from R3C14, the active cell, which is what you want to do.
3. Press Tab.

   The proposed response in the "to cells" field is not correct.

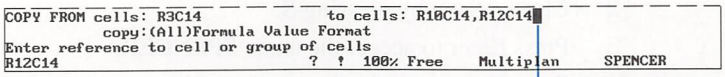
4 Press the Down Arrow key until the cell pointer reaches row 10.

Because the cells you want to copy to are not next to each other, you don't want to select a range with the colon as you've done before. Instead, you need to make a list of cells by using the comma.

5 Type , (a comma) to build a list of noncontiguous cells.

6 Press the Down Arrow key until the cell pointer reaches row 12.

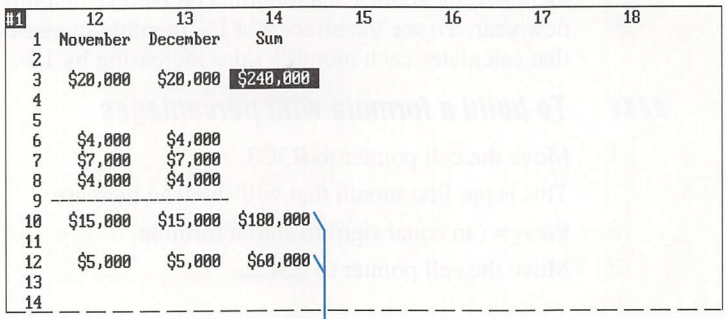
The list of cells now contains row 10 and row 12.



Multiplan builds the list as you move the cell pointer.

7 Press Enter.

The computed values appear in R10C14 and R12C14.



The values appear in the cells you specified in the list.

Saving Your Changes

You should save your changes frequently. If you save your worksheet frequently, you won't lose all of your work if there is a power failure or a problem with your equipment.

To save your changes

1. Choose Transfer by pressing T.
2. Choose Save by pressing S.
3. Press Enter to accept the name SPENCER.
4. Press Y to overwrite the previous file.

   Multiplan saves the changes you have made.

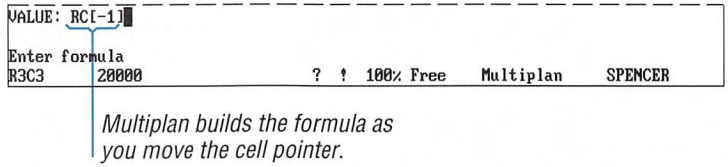
Using Percentages

Your information on Spencer Ceramics indicates that, in the previous year, sales increased by about 1% a month. You believe that this trend will continue in the new year. To see the effect of a 1% monthly increase in sales, build a formula that calculates each month's sales increasing by 1%.

To build a formula with percentages

1. Move the cell pointer to R3C3.

   This is the first month that will show an increase.
2. Press = (an equal sign) to start a formula.
3. Move the cell pointer to R3C2.



4. Type * (an asterisk).

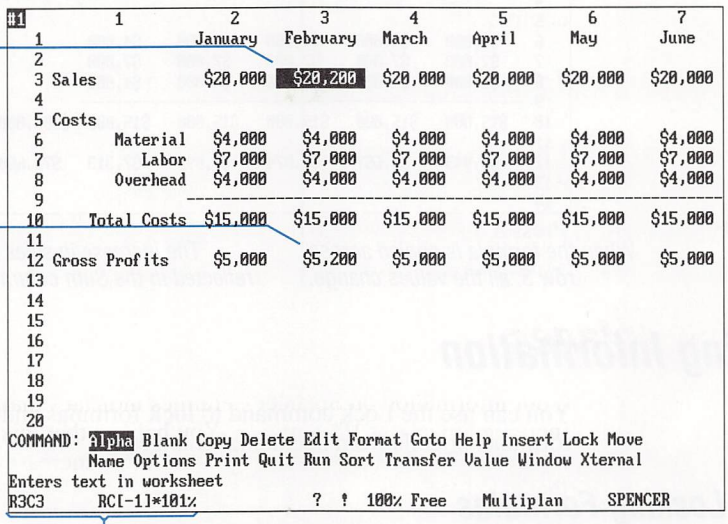
   Use an asterisk to specify multiplication.

   To show February's sales as a 1% increase over January's, you need to multiply January's sales by 101% (that is, February's sales are 101% of January's).
5. Type **101%**
6. Press Enter.

You see the new cell value for February showing a 1% increase over the previous month, January. The formula calculates the increase based on a relative reference.

February sales are 1% more than January sales.

Gross Profits reflects the increased sales.



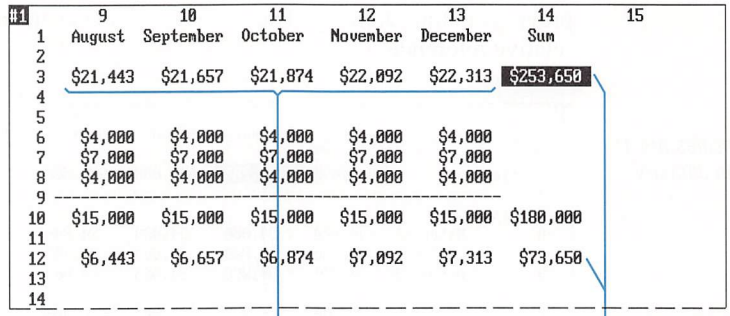
The formula in R3C3 is based on a relative reference.

To copy the percentage increase across the row

1. Choose Copy by pressing C.
2. Choose Right by pressing R.
3. Type **10**

   The proposed responses in the other fields are correct.
4. Press Enter.

   The formula with relative references is copied across the row, so each month's sales figures show a 1% increase over the previous month's figures. Move the cell pointer to R3C14 and see the new sales total.



	9	10	11	12	13	14	15
1	August	September	October	November	December	Sum	
2							
3	$21,443	$21,657	$21,874	$22,092	$22,313	$253,650	
4							
5							
6	$4,000	$4,000	$4,000	$4,000	$4,000		
7	$7,000	$7,000	$7,000	$7,000	$7,000		
8	$4,000	$4,000	$4,000	$4,000	$4,000		
9							
10	$15,000	$15,000	$15,000	$15,000	$15,000	$180,000	
11							
12	$6,443	$6,657	$6,874	$7,092	$7,313	$73,650	
13							
14							

When the formula is copied across row 3, all the values change.

The increase in sales is reflected in the Sum column.

Protecting Information

You can use the Lock command to **lock** formulas and cells. Locking protects formulas or cells from accidental changes.

Locking Formulas

After you choose the Lock Formulas command, you can't change any of the cells that contain formulas or text until you unlock them. The Lock Formulas command does not lock cells containing only values.

To lock your formulas

1. Choose Lock by pressing L.
2. Choose Formulas by pressing F.
3. Press Y to confirm your choice.

Multiplan locks the formulas, and the main command menu returns.

Locking Cells

You lock cells by choosing the Lock Cells command. When you choose the Lock Cells command, you select the cell or range of cells you wish to lock. All cells you select are locked, regardless of their contents. Once a cell is locked, you cannot enter new information in the cell until you have unlocked the cell. For more information on locking formulas and cells, see "Lock" in Chapter 13, "Commands."

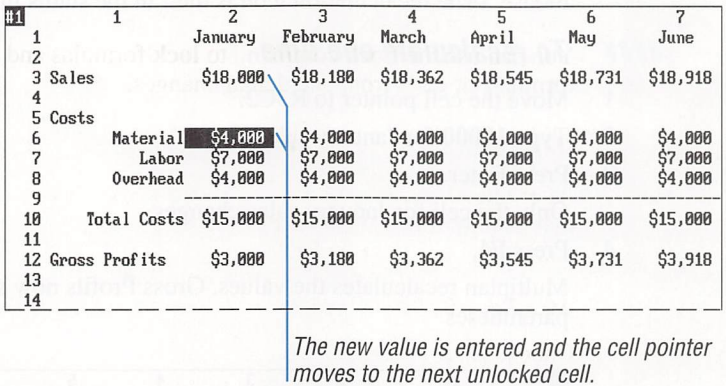
Moving to Unlocked Cells

You can move quickly from one unlocked cell to the next. Press F2 to move the cell pointer to the next unlocked cell; press Shift+F2 to move it to the previous unlocked cell.

To move to unlocked cells

1. Press Home to move the cell pointer to R1C1.
2. Press F2.

   The cell pointer moves to R3C2, which is the first cell from the beginning of the worksheet that contains numbers rather than text or a formula. Notice that blank cells are ignored.
3. Type **18000**
4. Press F2 again.



#1	1	2	3	4	5	6	7
1		January	February	March	April	May	June
2							
3	Sales	$18,000	$18,180	$18,362	$18,545	$18,731	$18,918
4							
5	Costs						
6	Material	$4,000	$4,000	$4,000	$4,000	$4,000	$4,000
7	Labor	$7,000	$7,000	$7,000	$7,000	$7,000	$7,000
8	Overhead	$4,000	$4,000	$4,000	$4,000	$4,000	$4,000
9							
10	Total Costs	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000
11							
12	Gross Profits	$3,000	$3,180	$3,362	$3,545	$3,731	$3,918
13							
14							

The new value is entered and the cell pointer moves to the next unlocked cell.

F2 enters information the same way the direction keys do. When the value in R3C2 changed, Multiplan recalculated the figures in the Sales and Gross Profits rows. The cell pointer is now at R6C2, the next unlocked cell. You can see that the projected gross profits drops from $5,000 to $3,000 in January, with similar reductions in the following months.

You might want to press F2 several more times to see which cells remain unlocked. You can press Shift+F2 to move backward through the unlocked cells.

5. Press Esc to return to the main menu.

Turning Off Automatic Recalculation

As you have seen, if you change the contents of a cell, Multiplan recalculates all of the cells that depend upon that cell. If your worksheet contains many formulas, each change requires some time to complete the recalculation. To make it faster to enter a lot of changes, you can turn off automatic recalculation by choosing the Options command.

To turn off automatic recalculation

1. Choose Options by pressing O.
2. In the "recalc" field, select No by pressing N.
3. Press Enter.

When you turn automatic recalculation off, Multiplan recalculates only if you press F4 (the recalculation key), or if you click the recalculation icon with the mouse. (The recalculation icon is the ! in the status line.)

To recalculate one time

1. Move the cell pointer to R3C2.
2. Type **10000** for January sales.
3. Press Enter.

   Only the cell for January sales changes.
4. Press F4.

   Multiplan recalculates the values. Gross Profits now shows losses in parentheses.

#1	1	2	3	4	5	6	7
1		January	February	March	April	May	June
2							
3	Sales	$10,000	$10,100	$10,201	$10,303	$10,406	$10,510
4							
5	Costs						
6	Material	$4,000	$4,000	$4,000	$4,000	$4,000	$4,000
7	Labor	$7,000	$7,000	$7,000	$7,000	$7,000	$7,000
8	Overhead	$4,000	$4,000	$4,000	$4,000	$4,000	$4,000
9							
10	Total Costs	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000
11							
12	Gross Profits	($5,000)	($4,900)	($4,799)	($4,697)	($4,594)	($4,490)
13							
14							

Losses are shown in parentheses.

Press F4 to recalculate, and the rest of the values change.

Use the Options command to change back to automatic recalculation.

To turn on automatic recalculation

1. Choose Options by pressing O.
2. In the "recalc" field, select Yes by pressing Y.
3. Press Enter.

Check to see if automatic recalculation is back on by changing the January sales amount back to the original value.

To change the sales amount back to its original value

1. In R3C2, type **20000**
2. Press Enter.

The values are automatically recalculated.

You have learned a lot about calculating with Multiplan. If you want, you can take a break now. Save your worksheet, and print it if you like. If you need to review saving and printing a worksheet, see "Saving a Worksheet" and "Printing a Worksheet" in Chapter 1, "Creating a Worksheet."

In the next chapter you will learn how to print your worksheet with more printing options.

3 Printing a Worksheet

In Chapters 1 and 2, you created a worksheet to analyze the finances of Spencer Ceramics. You also learned how to print a simple copy of your worksheet.

In this chapter you will learn more about printing. You will learn how to:

- Add finishing touches to your printed worksheets.
- Use various print options.
- Save copies of printed worksheets on a disk.

Before you can follow the lessons in this chapter, your printer must be installed and set up. Read your printer manual for connection instructions and any special installation requirements. Make sure you've installed the correct printer driver (PRD file) using the SETUP program and that you've specified it in the "printer" field of the Print Setup command. For more information, see "Print Setup" in Chapter 13, "Commands," and Appendix B, "Using PRD Files and Advanced Printing Features."

Customizing Your Worksheet

Before showing anyone your analysis of Spencer Ceramics, you want to make the printed worksheet as clear and easy to read as possible. You will add headers, footers, page numbers, and other useful information to your worksheet.

Adding Headers and Footers

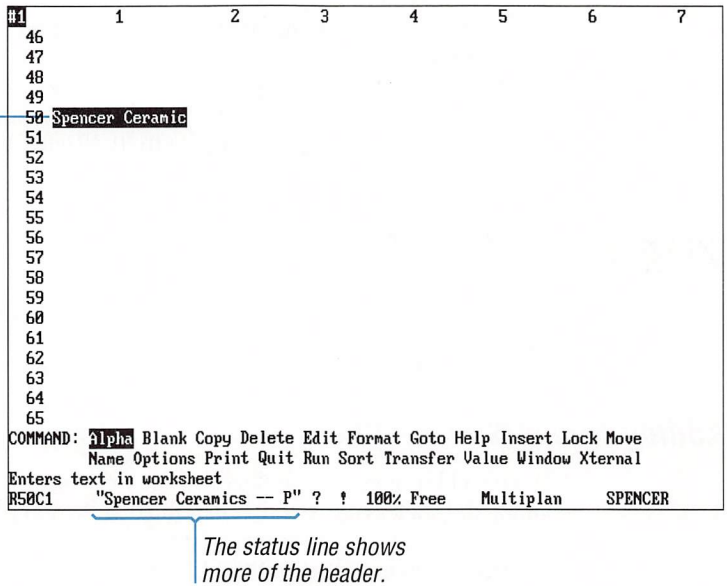
You can add headers and footers to your worksheet with the Print Heading command. Headers are text that is printed at the top of each page, and footers are text that is printed at the bottom of each page. First you enter the text in cells on your worksheet, and then you tell Multiplan to use those cells for headers and footers.

You want to add a header to your worksheet to show the name of your company.

To add a header

1. Start Multiplan and load the SPENCER worksheet.
2. Move the cell pointer to R50C1.

   Multiplan can use any cell or cells you select for the header. It is a good idea to put general information such as headers and footers in sections of the worksheet that you do not normally use and would not normally print.
3. Choose Alpha by pressing A.
4. Type **Spencer Ceramics -- Projected Sales and Costs**
5. Press Enter.



Only part of the header appears in the cell.

The status line shows more of the header.

Multiplan prints the header as it appears in the cell rather than in the status line. You could widen the column but that would distort the rest of the worksheet.

Instead, you can choose the Format Cells command to allow the contents of one cell to overlap the cells next to it.

To format continuous cells

1. Choose Format by pressing F.
2. Choose Cells by pressing C.
3. Type : (a colon) to select a range.
4. Move the cell pointer to R50C4.
5. Press Tab twice to move to the "format" field.
6. Press a direction key.

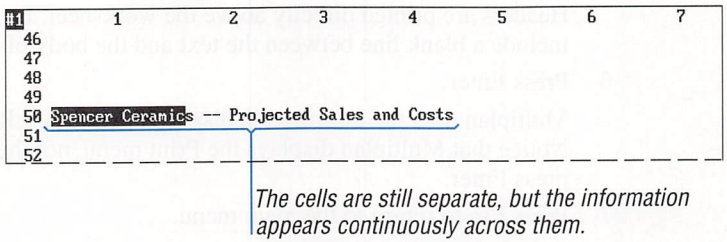
   Multiplan displays a list of available formats.
7. Move the cursor to @[cont].

   The proposed response in the "format" field is now @[cont] (for continuous).

```
FORMAT cells: R50C1:R50C4        alignment:(Def)Ctr Gen Left Right -
      format: @[cont]
Enter format or use direction keys to select from list
R50C1     "Spencer Ceramics -- P" ?  !  100% Free     Multiplan      SPENCER
```

8. Press Enter.

   The full title appears in the cells.



The cells are still separate, but the information appears continuously across them.

Now you need to tell Multiplan where to look on the worksheet for the header information.

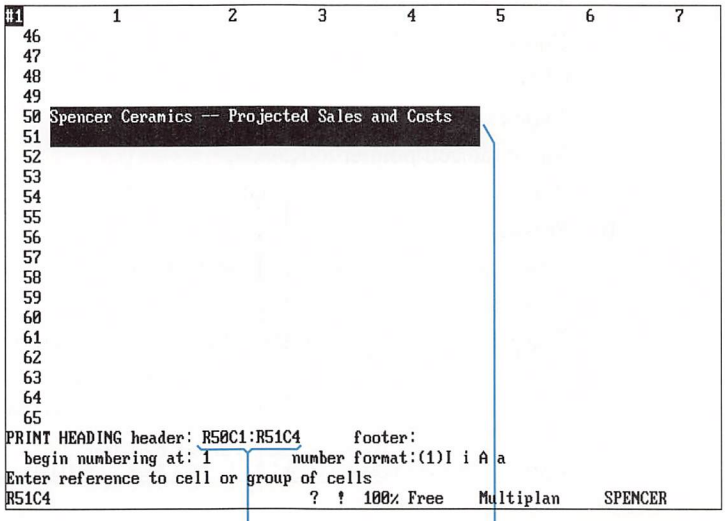
To select the header's location

1. Choose Print by pressing P.
2. Choose Heading by pressing H.

   Multiplan does not propose a response in the "header" or "footer" fields.
3. Press the Right Arrow key, and then press the Left Arrow key.

   This tells Multiplan that you want to specify a header, starting with the active cell (R50C1).
4. Type : (a colon) to select a range.
5. Move the cell pointer to R51C4.

   This selects the range R50C1:R51C4.



Multiplan builds the range as you move the cell pointer.

The cell pointer extends to cover the range of cells.

Headers are printed directly above the worksheet. By including row 51, you include a blank line between the text and the body of the worksheet.

6 Press Enter.

Multiplan uses the information displayed in R50C1:R51C4 for the header. Notice that Multiplan displays the Print menu, not the main menu after you press Enter.

7 Press Esc to return to the main menu.

Adding Page Numbers

If you have a long worksheet, you may want to add page numbers. You do not have to start at page number one; you can start at any number. You can number pages with standard numerals, Roman numerals, or with letters. Now add a footer that prints a page number.

To enter the footer text

1 Move the cell pointer to R52C1.

2 Choose Alpha by pressing A.

3 Type **Page &P**

The "&P" is a code that tells Multiplan to number the pages. For more information, see "Print Heading" in Chapter 13, "Commands."

4 Press Enter.

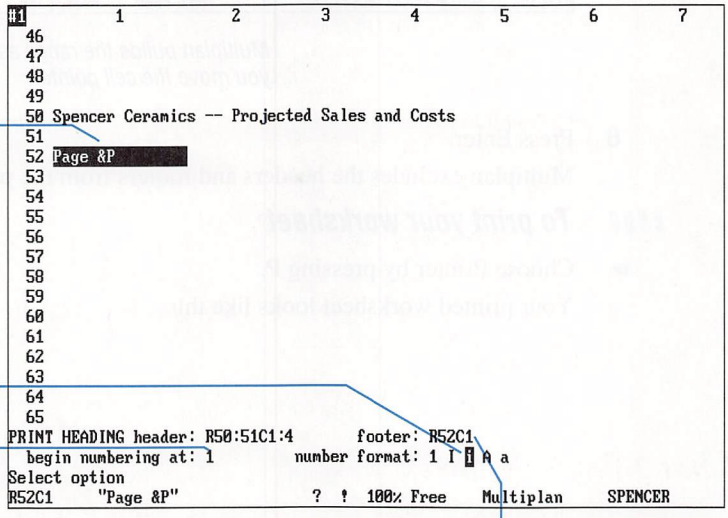
You now need to tell Multiplan where to look on the worksheet for the footer information.

To specify the footer's location

1. Choose Print by pressing P.
2. Choose Heading by pressing H.
3. Press Tab to move to the "footer" field.
4. Press the Right Arrow key, and then press the Left Arrow key.

   This tells Multiplan that you want to specify a footer using the active cell.
5. Press Tab twice to move to the "number format" field.
6. Press the Spacebar twice to select i.

   This tells Multiplan to print page numbers in lowercase Roman numerals.



&P is a code that tells Multiplan where to print the page number.

Select "i" to print lowercase Roman numerals...

...starting on page 1.

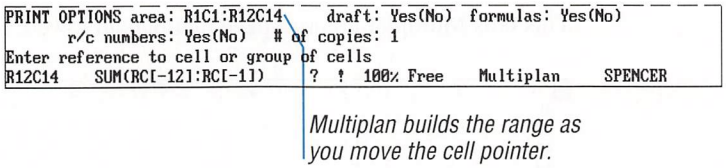
The "footer" field specifies the location of the footer.

7. Press Enter.

Now you can print your worksheet with headers and footers, but when you print the worksheet, you don't want to show the actual cells where you entered the header or footer. Choose the Print Options command to exclude the rows with header and footer information.

To select the part of the worksheet to print

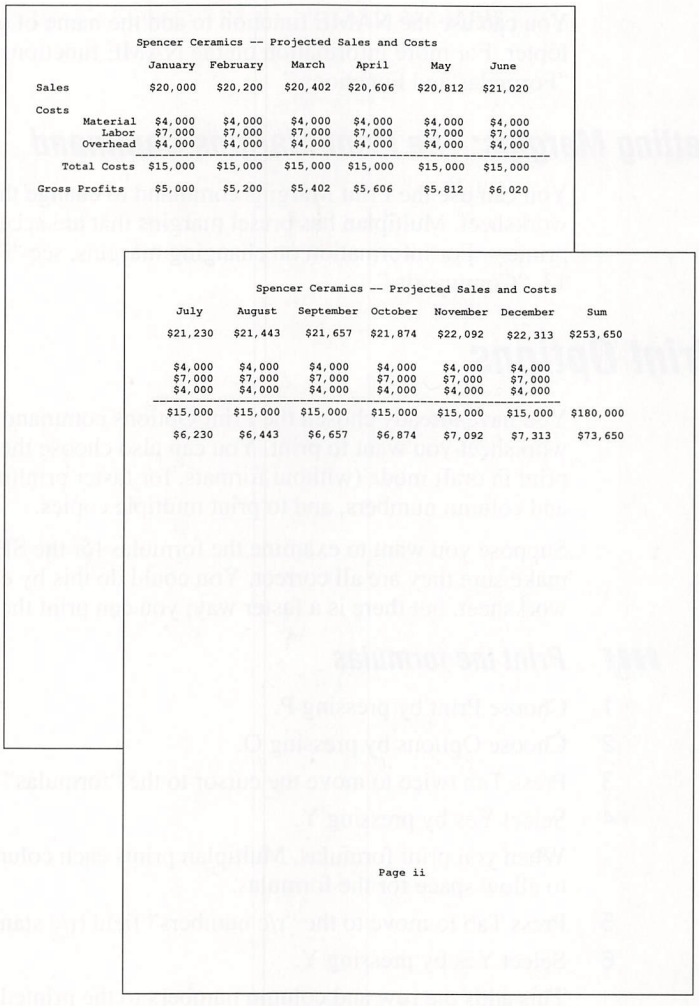
1. Press Home.
   You want to start printing at the beginning of the worksheet.
2. Choose Options by pressing O.
   The proposed response in the "area" field is the entire worksheet.
3. Press the Right Arrow key, and then press the Left Arrow key.
4. Type : (a colon) to select a range.
5. Move the cell pointer to R12C14.
   R12C14 is the last cell that you want to print.



6. Press Enter.
   Multiplan excludes the headers and footers from the print area.

To print your worksheet

- Choose Printer by pressing P.
  Your printed worksheet looks like this:



Spencer Ceramics -- Projected Sales and Costs

	January	February	March	April	May	June
Sales	$20,000	$20,200	$20,402	$20,606	$20,812	$21,020
Costs						
Material	$4,000	$4,000	$4,000	$4,000	$4,000	$4,000
Labor	$7,000	$7,000	$7,000	$7,000	$7,000	$7,000
Overhead	$4,000	$4,000	$4,000	$4,000	$4,000	$4,000
Total Costs	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000
Gross Profits	$5,000	$5,200	$5,402	$5,606	$5,812	$6,020

Spencer Ceramics -- Projected Sales and Costs

July	August	September	October	November	December	Sum
$21,230	$21,443	$21,657	$21,874	$22,092	$22,313	$253,650
$4,000	$4,000	$4,000	$4,000	$4,000	$4,000	
$7,000	$7,000	$7,000	$7,000	$7,000	$7,000	
$4,000	$4,000	$4,000	$4,000	$4,000	$4,000	
$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	$180,000
$6,230	$6,443	$6,657	$6,874	$7,092	$7,313	$73,650

Page ii

Header and footer information is saved as part of the worksheet. For more information about headers and footers, see "Print Heading" in Chapter 13, "Commands."

Adding Other Information with Functions

You can print the current date and time as part of a header or footer by using the NOW function. For information on adding dates and times to the worksheet, see Chapter 6, "Dates, Times, and Custom Formats."

You can use the NAME function to add the name of a worksheet to a header or footer. For more information on the NAME function, see "NAME" in Chapter 14, "Formulas and Functions."

Setting Margins: The Print Margins Command

You can use the Print Margins command to change the margins of the printed worksheet. Multiplan has preset margins that are acceptable for most 80-column printers. For information on changing margins, see "Print Margins" in Chapter 13, "Commands."

Setting Print Options

You have already chosen the Print Options command to select which parts of the worksheet you want to print. You can also choose the Print Options command to print in draft mode (without formats, for faster printing), to print formulas, row and column numbers, and to print multiple copies.

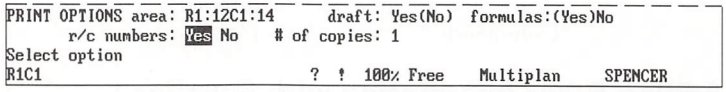
Suppose you want to examine the formulas for the SPENCER worksheet and make sure they are all correct. You could do this by examining each cell on the worksheet, but there is a faster way: you can print the formulas.

Print the formulas

1. Choose Print by pressing P.
2. Choose Options by pressing O.
3. Press Tab twice to move the cursor to the "formulas" field.
4. Select Yes by pressing Y.

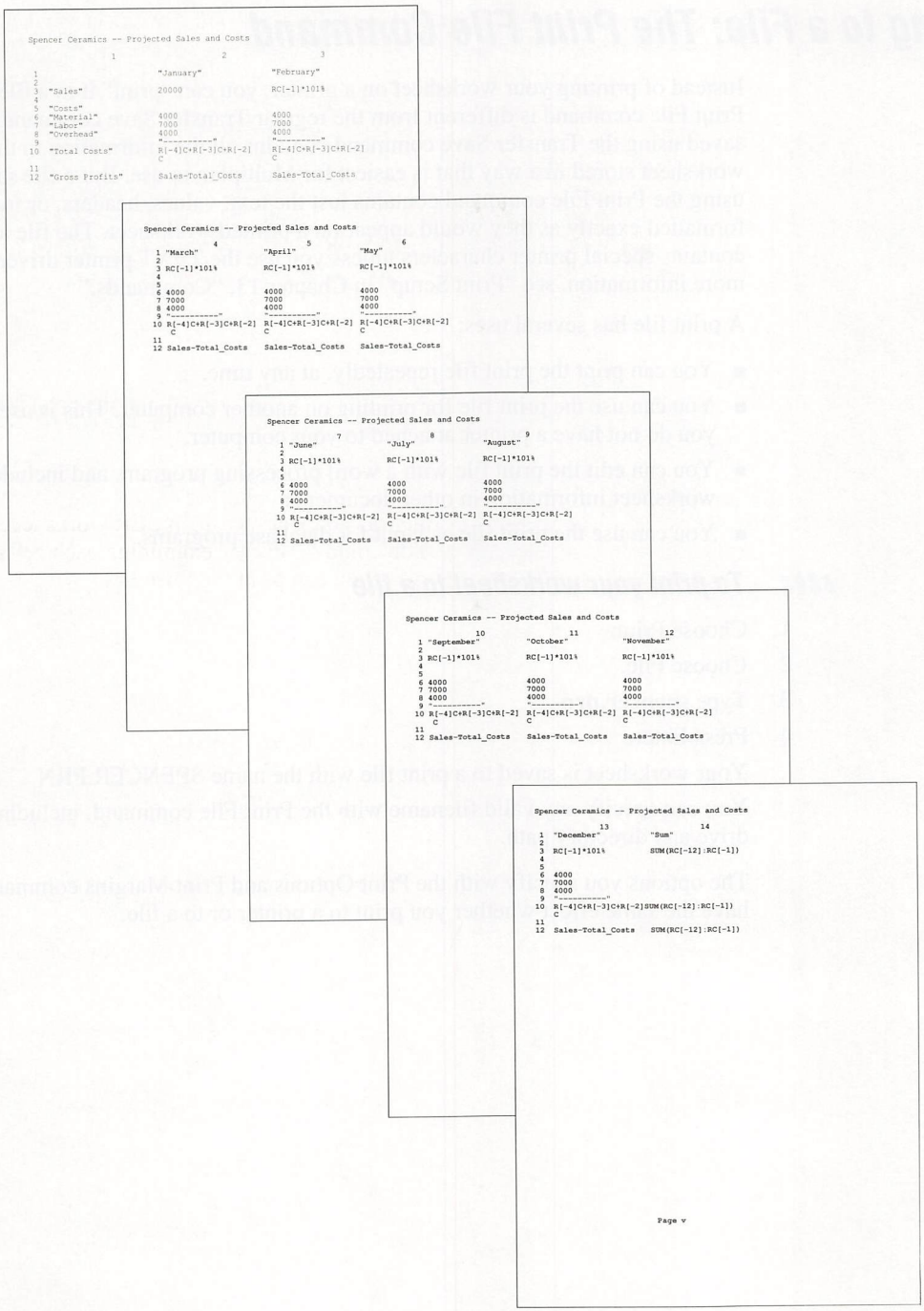
   When you print formulas, Multiplan prints each column twice its normal width to allow space for the formulas.
5. Press Tab to move to the "r/c numbers" field (r/c stands for row/column).
6. Select Yes by pressing Y.

   This adds the row and column numbers to the printed worksheet so that you can find the cells easily.



7. Press Enter.
8. Choose Print by pressing P.

   Multiplan prints your worksheet with formulas instead of values.



Spencer Ceramics -- Projected Sales and Costs

	1	2	3
1		"January"	"February"
2			
3	"Sales"	20000	RC[-1]*101%
4			
5	"Costs"		
6	"Material"	4000	4000
7	"Labor"	7000	7000
8	"Overhead"	4000	4000
9		"----------"	"----------"
10	"Total Costs"	R[-4]C+R[-3]C+R[-2]C	R[-4]C+R[-3]C+R[-2]C
11			
12	"Gross Profits"	Sales-Total_Costs	Sales-Total_Costs

Spencer Ceramics -- Projected Sales and Costs

	4	5	6
1	"March"	"April"	"May"
2			
3	RC[-1]*101%	RC[-1]*101%	RC[-1]*101%
4			
5			
6	4000	4000	4000
7	7000	7000	7000
8	4000	4000	4000
9	"----------"	"----------"	"----------"
10	R[-4]C+R[-3]C+R[-2]C	R[-4]C+R[-3]C+R[-2]C	R[-4]C+R[-3]C+R[-2]C
11			
12	Sales-Total_Costs	Sales-Total_Costs	Sales-Total_Costs

Spencer Ceramics -- Projected Sales and Costs

	7	8	9
1	"June"	"July"	"August"
2			
3	RC[-1]*101%	RC[-1]*101%	RC[-1]*101%
4			
5			
6	4000	4000	4000
7	7000	7000	7000
8	4000	4000	4000
9	"----------"	"----------"	"----------"
10	R[-4]C+R[-3]C+R[-2]C	R[-4]C+R[-3]C+R[-2]C	R[-4]C+R[-3]C+R[-2]C
11			
12	Sales-Total_Costs	Sales-Total_Costs	Sales-Total_Costs

Spencer Ceramics -- Projected Sales and Costs

	10	11	12
1	"September"	"October"	"November"
2			
3	RC[-1]*101%	RC[-1]*101%	RC[-1]*101%
4			
5			
6	4000	4000	4000
7	7000	7000	7000
8	4000	4000	4000
9	"----------"	"----------"	"----------"
10	R[-4]C+R[-3]C+R[-2]C	R[-4]C+R[-3]C+R[-2]C	R[-4]C+R[-3]C+R[-2]C
11			
12	Sales-Total_Costs	Sales-Total_Costs	Sales-Total_Costs

Spencer Ceramics -- Projected Sales and Costs

	13	14
1	"December"	"Sum"
2		
3	RC[-1]*101%	SUM(RC[-12]:RC[-1])
4		
5		
6	4000	
7	7000	
8	4000	
9	"----------"	
10	R[-4]C+R[-3]C+R[-2]C	SUM(RC[-12]:RC[-1])
11		
12	Sales-Total_Costs	SUM(RC[-12]:RC[-1])

Page v

Printing to a File: The Print File Command

Instead of printing your worksheet on a printer, you can "print" it to a file. The Print File command is different from the regular Transfer Save command. A file saved using the Transfer Save command contains all the information in the worksheet stored in a way that is easiest for Multiplan to use. But a file saved using the Print File command contains just the text, values, headers, or footers formatted exactly as they would appear on a printed worksheet. The file also contains special printer characters unless you use the TEXT printer driver. For more information, see "Print Setup" in Chapter 13, "Commands."

A print file has several uses:

- You can print the print file repeatedly, at any time.
- You can use the print file for printing on another computer. This is useful if you do not have a printer attached to your computer.
- You can edit the print file with a word processing program, and include the worksheet information in other documents.
- You can use the print file as input for database programs.

To print your worksheet to a file

1. Choose Print.
2. Choose File.
3. Type **spencer.prn**
4. Press Enter.

Your worksheet is saved to a print file with the name SPENCER.PRN.

You can specify any valid filename with the Print File command, including the drive and directory path.

The options you specify with the Print Options and Print Margins commands have the same effect whether you print to a printer or to a file.

Congratulations!

You have completed the first part of this manual, "Learning Multiplan." You have learned how to :

- Create, save, and print worksheets.
- Label rows and columns.
- Enter text and numbers.
- Build formulas.
- Sort, copy, move, and protect information.
- Name cells.
- Customize printed worksheets.

The completed SPENCER worksheet is on the Setup disk and is named SPENCER1.MOD. The .MOD extension stands for "model." There are several model worksheets on the Setup disk—you'll use many of these worksheets to complete the examples in "Exploring Multiplan," the next section of this manual.

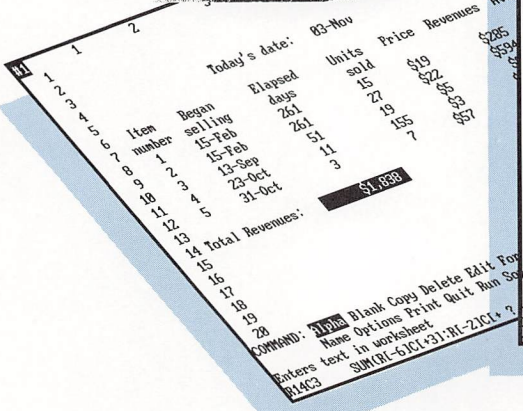
Now, you can continue learning about Multiplan, or you can start creating worksheets of your own. Go on to "Exploring Multiplan" if you want to learn how to use more of Multiplan's features.

3

Exploring Multiplan

4 Linking 99
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7 Conditional Formulas 135
8 Tables 141
9 Running Macros 147
10 Auditing a Worksheet 173
11 Database 187
12 Iteration 211





#1	1	2	3	4	5	6	7
1		January	February	March	April	May	June
2							
3	Sales	$20,000	$20,200	$20,402	$20,606	$20,812	$21,020
4							
5	Costs						
6	Material	$4,000	$4,000	$4,000	$4,000	$4,000	$4,000
7	Labor	$7,000	$7,000	$7,000	$7,000	$7,000	$7,000
8	Overhead	$4,000	$4,000	$4,000	$4,000	$4,000	$4,000
9							
10	Total Costs	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000
11							
12	Gross Profits	$5,000	$5,200	$5,402	$5,606	$5,812	$6,020
13							
14	Profit Sharing	$200	$208	$216	$336	$349	$361
15							
16							
17							
18							
19							
20							

COMMAND: Alpha Blank Copy Delete Edit Format Goto Help Insert Lock Move
Name Options Print Quit Run Sort Transfer Value Window Xternal
Enters text in worksheet
R14C2 IF(AND(R[-11]C>21000,R[? ! 100% Free Multiplan SPENCER1.MOD

4 Linking

With Multiplan, you can create separate worksheets, and then **link**, or connect, them. After you link them, worksheets can exchange information with each other.

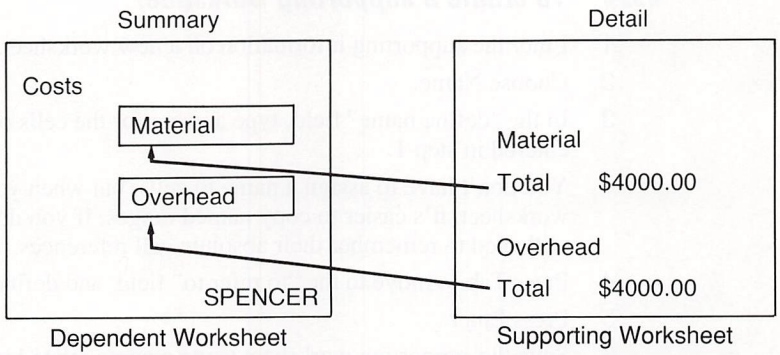
This chapter explains how to:

- Use supporting and dependent worksheets.
- Link worksheets.
- Examine links between worksheets.
- Delete links between worksheets.
- Renew a dependent worksheet.
- Set up external relationships.

Supporting and Dependent Worksheets

Worksheets that provide data to other worksheets are called **supporting worksheets**. Worksheets that use data from other worksheets are called **dependent worksheets**. Once a supporting worksheet has been set up, you can copy named cells on the supporting worksheet to the dependent worksheet and establish an external link between the worksheets.

For example, the information on Spencer Ceramics can be linked like this:



Once you create an external link, you can repeatedly renew the dependent worksheet with information from supporting worksheets. If a particular amount changes on one of supporting worksheets, then corresponding amounts on the dependent worksheet also change the next time the dependent worksheet is loaded or renewed with the External Renew command. For example, you might create a supporting worksheet with information about sales and another

supporting worksheet with information about costs. You can create a third worksheet (a dependent worksheet) to summarize all financial activity by linking it to the sales and costs worksheets.

Linking Worksheets

The procedures in this section explain how to link worksheets. Linking consists of four basic steps:

- Creating a supporting worksheet
- Copying information to a dependent worksheet and establishing links
- Naming areas on the dependent worksheet
- Saving the dependent worksheet

These steps are explained in detail in this section.

Creating a Supporting Worksheet

The first step in linking worksheets is entering and naming supporting information. As you enter information on the supporting worksheet, think about how it should be organized. You will eventually copy cells or ranges of cells to the dependent worksheet, and the size and shape of the range of cells on the supporting and dependent worksheets must correspond to each other.

To create a supporting worksheet

1. Enter the supporting information on a new worksheet.
2. Choose Name.
3. In the "define name" field, type a name for the cells or ranges of cells that you entered in step 1.

   You don't have to assign a name to cells, but when you create the dependent worksheet, it's easier to copy named ranges. If you don't name the cells, you will need to remember their absolute cell references.
4. Press Tab to move to the "to refer to" field, and define the range.
5. Press Enter.
6. Save the supporting worksheet using a name related to the dependent worksheet.

   Giving supporting and dependent worksheets related names will help you to recognize which worksheets belong together.

Copying Information and Establishing Links

Before you can link worksheets, you must reserve space on the dependent worksheet for the information you copy from the supporting worksheet. The cells that receive the information must be blank and unlocked.

Use the External Copy command to copy information and establish external links between worksheets. The External Copy command copies into blank cells only (to protect information on the dependent worksheet from accidental erasure) and does not copy cell formats.

You can also use the External Copy command to copy information from a supporting worksheet to a dependent worksheet without establishing a link between the worksheets. For example, you can avoid having to retype a frequently used set of row or column titles by copying them from an old worksheet to a new one. In this situation you would not want to establish a permanent link between the old and new worksheets, but merely copy the text. Copying without linking is useful when you want to copy information from one worksheet to another without having both worksheets open.

To copy information with links

1. Load or create the dependent worksheet.
2. Choose Xternal.
3. Choose Copy.
4. In the "from sheet" field, type the filename of the supporting worksheet or press a direction key to select from the list of available filenames.
5. Press Tab to move to the "name" field, and type the name of the range that you want to copy or press a direction key to select from the list of available names. You can also enter the absolute reference, instead of a name.
6. Press Tab to move to the "to" field, and enter the cell you want to copy to.

   Multiplan proposes the cell or the upper-left corner of a range of cells containing the cell pointer.
7. Press Tab to move to the "linked" field, and press Y to select Yes.

   When Yes is selected, Multiplan establishes a link between the supporting and dependent worksheets; otherwise, Multiplan copies the information only once.
8. Press Enter.

   Multiplan copies the data from the supporting worksheet to the dependent worksheet. During an external link, Multiplan displays the total number of cells to copy and then counts down to zero so you can monitor its progress.

Once you establish an external link between worksheets, Multiplan locks all of the affected cells on the dependent worksheet. You cannot unlock the cells until you remove the link.

To copy information without links

1. Follow steps 1 through 6 in the previous procedure.
2. Press Tab to move to the "linked" field, and press N to select No.
3. Press Enter.

   Multiplan copies the information, but does not establish an external link.

Naming Areas on the Dependent Worksheet

Once the information is copied, you need to name the areas on the dependent worksheet. When you choose the Name command immediately after performing an external copy, the proposed response in the "define name" field is the name of the supporting worksheet, followed by a period, followed by the name you typed in the "name" field of the External Copy command (for example, SPSALES.Monthly_Sales). This makes it easy to define names for the cells that receive values from another worksheet. This is the only time Multiplan proposes the name of the supporting worksheet as part of a name on the dependent worksheet. If you want to name the cells on the dependent worksheet with Multiplan's proposed name, choose the Name command immediately after you carry out the External Copy command.

To name the cells on the dependent worksheet

1. Choose Name.
2. Press Enter to accept the proposed name.

Saving Links Between Worksheets

The link between the worksheets is not permanent until you save the dependent worksheet. Multiplan records the relationship established with the External Copy command in both saved worksheets. If you don't save the dependent worksheet before you start work on another worksheet or before you stop Multiplan, you will have to choose the External Copy command again.

When you move the cell pointer to any of the cells you copied from the supporting worksheet, Multiplan displays the name of the supporting worksheet and the name of the cell or range on the status line, both enclosed in square brackets (for example, [SPSALES Monthly_Sales]).

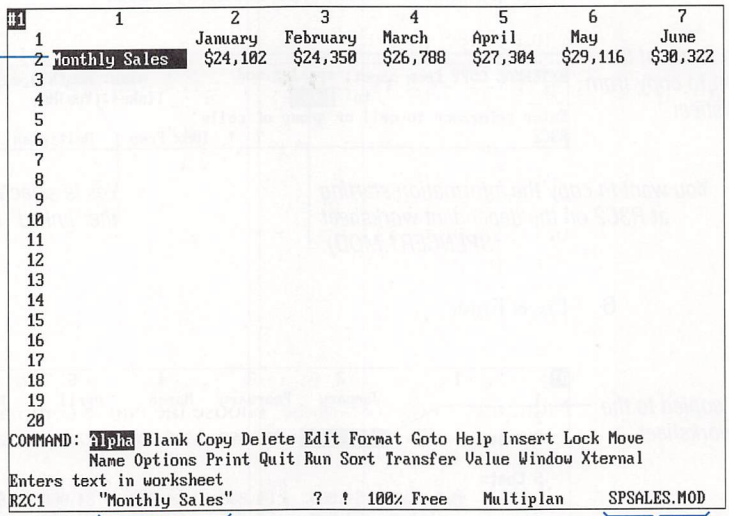
Example Suppose that Spencer Ceramics anticipates even higher sales for the new year. You can use the new projected sales information on a worksheet called SPSALES.MOD and link it to the SPENCER1.MOD worksheet.

In this example, you will open the supporting worksheet SPSALES.MOD to see the sales information; normally, you do not need to open supporting worksheets when linking.

1 Load the SPSALES.MOD worksheet.

The example files are on the Setup disk; run the SETUP program to copy the files, if you haven't already done so.

The new sales information is in a supporting worksheet.



	1	2	3	4	5	6	7
1		January	February	March	April	May	June
2	Monthly Sales	$24,102	$24,350	$26,788	$27,304	$29,116	$30,322

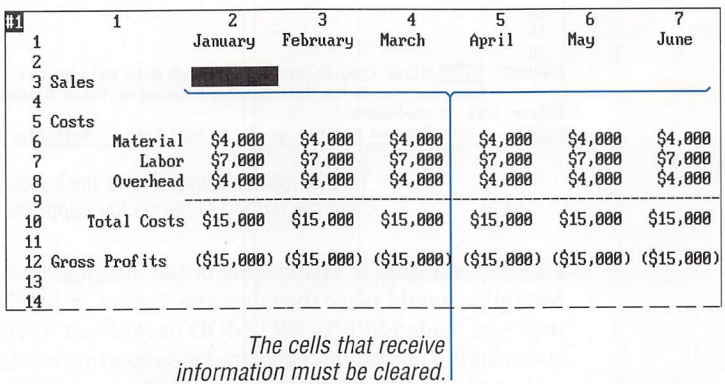
```
COMMAND: Alpha Blank Copy Delete Edit Format Goto Help Insert Lock Move
         Name Options Print Quit Run Sort Transfer Value Window Xternal
Enters text in worksheet
R2C1     "Monthly Sales"          ? ! 100% Free    Multiplan     SPSALES.MOD
```

The sales information is named "Monthly Sales."

The supporting worksheet is called SPSALES.MOD.

2 Load the SPENCER1.MOD worksheet and move the cell pointer to R3C2.

3 Choose Blank and clear the information in R3C2:13.



	1	2	3	4	5	6	7
1		January	February	March	April	May	June
2							
3	Sales						
4							
5	Costs						
6	Material	$4,000	$4,000	$4,000	$4,000	$4,000	$4,000
7	Labor	$7,000	$7,000	$7,000	$7,000	$7,000	$7,000
8	Overhead	$4,000	$4,000	$4,000	$4,000	$4,000	$4,000
9							
10	Total Costs	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000
11							
12	Gross Profits	($15,000)	($15,000)	($15,000)	($15,000)	($15,000)	($15,000)
13							
14							

The cells that receive information must be cleared.

4 Choose Xternal.

5 Choose Copy and enter the following information:

- in the "from sheet" field, type **spsales.mod**
- in the "name" field, type **monthly_sales**

Monthly Sales is the name of the information you want to copy from the supporting worksheet (SPSALES.MOD).

```
EXTERNAL COPY from sheet: spsales.mod          name: monthly_sales
                      to: R3C2                 linked:(Yes)No
Enter reference to cell or group of cells
R3C2                                ? ! 100% Free    Multiplan     SPENCER1.MOD
```

You want to copy the information starting at R3C2 on the dependent worksheet (SPENCER1.MOD).

Yes is selected in the "linked" field.

6 Press Enter.

The information is copied to the SPENCER1.MOD worksheet starting at R3C2.

```
#1      1          2          3          4          5          6          7
 1                 January    February   March      April      May        June
 2
 3 Sales           $24,102    $24,350    $26,788    $27,304    $29,116    $30,322
 4
 5 Costs
 6       Material  $4,000     $4,000     $4,000     $4,000     $4,000     $4,000
 7         Labor   $7,000     $7,000     $7,000     $7,000     $7,000     $7,000
 8      Overhead   $4,000     $4,000     $4,000     $4,000     $4,000     $4,000
 9
10   Total Costs   $15,000    $15,000    $15,000    $15,000    $15,000    $15,000
11
12 Gross Profits   $9,102     $9,350     $11,788    $12,304    $14,116    $15,322
13
14
15
16
17
18
19
20
COMMAND: Alpha Blank Copy Delete Edit Format Goto Help Insert Lock Move
         Name Options Print Quit Run Sort Transfer Value Window Xternal
Enters text in worksheet
R3C2     [spsales.mod monthly_sa ? ! 100% Free    Multiplan     SPENCER1.MOD
```

The bracketed name shows the supporting worksheet and the named range on the supporting worksheet.

Later, if you were to change any of the information on SPSALES.MOD, Multiplan would place the new sales figures in SPENCER1.MOD the next time you loaded SPENCER1.MOD or renewed it with the External Renew command. You could create similar supporting worksheets for material, labor, and overhead and use SPENCER1.MOD as a summary worksheet.

7 Clear the worksheet or quit Multiplan without saving your changes. Choose Transfer Clear All and press N, or choose Quit and press N.

Examining Links

You can examine the links between worksheets by choosing the External List command.

To examine links

1. Choose Xternal.
2. Choose List.

   Multiplan displays a list of up to eight linked supporting and dependent worksheets.
3. Press any key to return to the active worksheet.

Deleting Links Between Worksheets

You may want to delete links between worksheets. For example, you must delete links in order to unlock linked cells. This process is very similar to establishing links.

To delete a link

1. Load the dependent worksheet.
2. Choose Xternal.
3. Choose Copy.
4. In the "from sheet" field, type the name of the supporting worksheet supplying the link you want to delete.

   The name of the worksheet that you copied most recently is the proposed response.
5. Press Tab to move to the "name" field, and type the name of the linked range that you want to delete or press a direction key to select from the list of available names.
6. Press Tab to move to the "to" field, and press Del to delete the proposed response.
7. Press Enter.

The values copied from the supporting worksheet disappear.

Example The SPSALES.MOD worksheet is linked to a worksheet named SPENCER2.MOD. You can delete the link between these worksheets.

1 Load the SPENCER2.MOD worksheet.

The example files are on the Setup disk; run the SETUP program to copy the files, if you haven't already done so.

2 Choose Xternal.

3 Choose Copy.

The name of the supporting worksheet (SPSALES.MOD) is proposed in the "from sheet" field.

4 In the "name" field, type **monthly_sales**

5 In the "to" field, press Del to delete the proposed response.

Removing the reference in the "to" field deletes the link.

```
EXTERNAL COPY from sheet: SPSALES.MOD          name: monthly_sales
                      to:                    linked:(Yes)No
Enter reference to cell or group of cells
R1C1                              ? ! 100% Free    Multiplan    SPENCER2.MOD
```

Always create and delete links by choosing External Copy with the dependent worksheet active.

6 Press Enter.

Multiplan deletes the link between the worksheets.

#1	1	2	3	4	5	6	7
1		January	February	March	April	May	June
2							
3	Sales						
4							
5	Costs						
6	Material	$4,000	$4,000	$4,000	$4,000	$4,000	$4,000
7	Labor	$7,000	$7,000	$7,000	$7,000	$7,000	$7,000
8	Overhead	$4,000	$4,000	$4,000	$4,000	$4,000	$4,000
9							
10	Total Costs	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000
11							
12	Gross Profits	($15,000)	($15,000)	($15,000)	($15,000)	($15,000)	($15,000)
13							
14							

The affected cells are cleared when the link is deleted.

7 Clear the worksheet or quit Multiplan without saving your changes. Choose Transfer Clear All and press N, or choose Quit and press N.

Deleting Names

Once you define a name, it is still defined on the dependent worksheet, even after you delete the link to the supporting worksheet. You may want to delete the definition.

To delete a name

1. Choose Name.
2. Type the name you want to delete in the "define name" field or press a direction key to select from a list of available names.
3. Press Tab to move to the "to refer to" field, and press Del to delete the proposed response.
4. Press Enter.

   The name is no longer defined.

Renewing a Dependent Worksheet

Once worksheets are linked, Multiplan locks cells on the dependent worksheet so that you cannot accidentally remove important information, but the corresponding cells on the supporting worksheet can be revised.

NOTE Be careful not to remove essential information from supporting worksheets. If you get a #REF!, #NAME!, or #VALUE! error after changing a value on a supporting worksheet, check the supporting worksheet to make sure that you didn't accidentally clear or move an important value or name.

Revising information on a supporting worksheet has no immediate effect on its dependent worksheets. You must renew the dependent worksheet so it will have the most up-to-date information.

To renew a dependent worksheet

- Load the dependent worksheet.

  Multiplan renews links automatically every time you load a dependent worksheet.

  or

1. With the dependent worksheet active, choose Xternal.
2. Choose Renew.

   You can also renew the dependent worksheet by pressing Shift+F6 with the dependent worksheet active.

Revising and Renewing with Multiple Windows

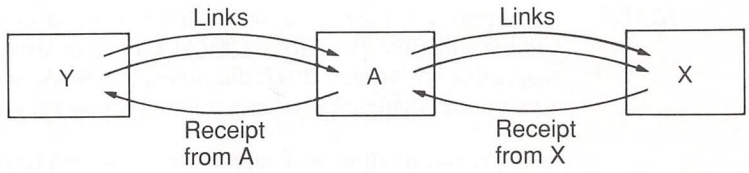
To make changes in the supporting worksheet and simultaneously see how the changes affect the dependent worksheet, you can open multiple windows. Load the dependent worksheet into a window, and then load a supporting worksheet into another window.

When you revise information in the supporting worksheet, changes appear on the dependent worksheet as soon as you choose External Renew (or press Shift+F6) while the dependent worksheet is active. The changes do not become permanent until you save the worksheets. For more information on using multiple windows, see Chapter 5, "Using Windows."

Understanding External Relationships

This section explains how Multiplan handles external relationships—not just one worksheet supporting another, but several interconnected worksheets, since worksheets can be both supporting and dependent at the same time. This information applies to the External commands. For more information on these commands, see "External" in Chapter 13, "Commands."

External relationships between worksheets can be illustrated as follows:



Active Worksheet

Worksheets depending on Y	Worksheets supporting A	Worksheets supporting X
A	Y	A
	Worksheets depending on A	
	X	

Each time you renew a dependent worksheet, Multiplan recopies all the information from all links to supporting worksheets.

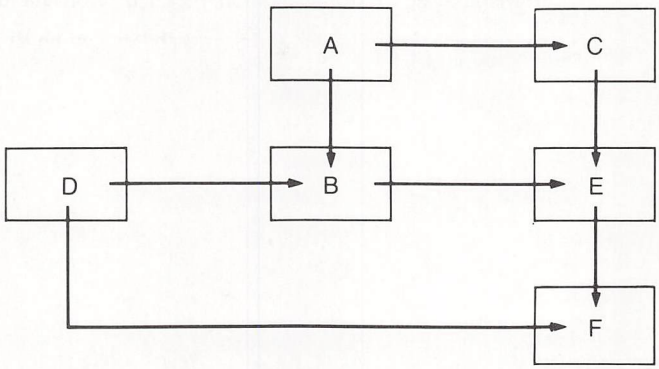
For example, when you revise worksheet Y, nothing changes on worksheet A until you renew worksheet A. When worksheet A is renewed, Multiplan reads worksheet Y and copies the information to worksheet A.

Similarly, when worksheet A changes (which can be caused by changes in worksheet Y), worksheet X does not change until you renew it. When worksheet X is renewed, Multiplan reads worksheet A and copies its data to worksheet X. If the information read from A to X is to be current with the information on Y, you must have renewed worksheet A at least once since you renewed worksheet X. Multiplan copies information one link at a time.

In a more complex set of worksheets, the relationships between the worksheets can be unraveled using the External List command on each worksheet and creating a relationship diagram similar to the one shown in the preceding illustration.

Renewing Multiple Worksheets

The most efficient way to ensure that the information on all related worksheets is renewed is illustrated in the following diagram:



In this example, worksheets A and D are not supported by any other worksheets. Suppose that the information in A and D changes, and you want to make sure that this change is reflected in all the worksheets that either directly or indirectly depend on these two worksheets.

The way you renew all the worksheets in the relationship is to first make the changes to worksheets A and D, then renew worksheets C and B, then renew worksheet E, and, finally, renew worksheet F. By updating the worksheets in this order, you ensure that all the changes appear on the dependent worksheets with the fewest number of necessary updates.

5 Using Windows

In this chapter you will learn how to open **windows**. A window is a rectangle that displays a different part of the worksheet. By setting up windows on your screen, you can view parts of a worksheet or several different worksheets at the same time.

This chapter explains how to:

- Open windows.
- Link windows for scrolling.
- Fix headings in place.
- Add borders to windows.
- Close windows.
- Clear windows.
- Change the colors on your screen.
- Display multiple worksheets.
- Copy information from one worksheet to another.

Opening Windows

With the Window Split Horizontal command you can **split** a window across the screen at the row number you choose. With the Window Split Vertical command you can split a window vertically at the column you choose. To split a window means to open a new window on the same worksheet. Then, you can either load another worksheet into the new window or display different areas of the same worksheet in both windows.

To open a new window

1. Move the cell pointer to where you want to split the screen and open a new window.
2. Choose Window.
3. Choose Split.
4. Choose Horizontal or Vertical depending on which direction you want Multiplan to split the screen.
5. In the "at row" or "at column" field, type the number of the row or column where you want to split the window.

   Multiplan proposes the location of the cell pointer.
6. Press Enter.

You can also use a mouse to split windows that have borders by pointing to the position on the window border where you want to split the window and then clicking either button.

For more information on window borders, see "Adding Borders to Windows" later in this chapter.

To move between windows

1. Choose Goto.
2. Choose Window.
3. In the "window number," "row," and "column" fields, enter the window number and row and column you want to move to.

   You can also move from window to window by pressing F1 to move to the next window and Shift+F1 to move to the previous window.

You can move between windows with a mouse by clicking any cell in a window.

Only one of the open windows can be active at a time. The cell pointer is in the active window, and the active window's number indicator, in the upper-left corner of the worksheet, is highlighted.

If you are displaying a single worksheet and have opened several windows, Multiplan saves the window configuration when you save the worksheet. The next time you load the worksheet, you will see the same windows as before. However, if more than one window has already been opened on the active worksheet, then loading a worksheet that was saved with several windows will not override the existing window configuration.

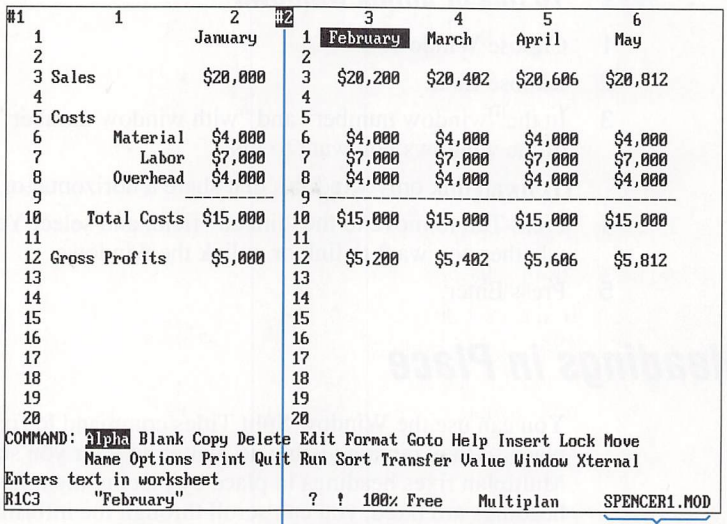
If you are displaying two or more worksheets, Multiplan does not save the window information when you save the second or subsequent worksheets.

Example Open two windows on the SPENCER1.MOD worksheet by splitting the window vertically.

1. Load the SPENCER1.MOD worksheet and move the cell pointer to R1C3 .

   The example files are on the Setup disk; run the SETUP program to copy the files, if you haven't already done so.
2. Choose Window.
3. Choose Split.
4. Choose Vertical.

   Multiplan proposes column 3.
5. Press Enter to accept the proposed response.



The new window is window #2... *...in the SPENCER1.MOD worksheet.*

6 Clear the worksheet or quit Multiplan without saving your changes. Choose Transfer Clear All and press N, or choose Quit and press N.

Linking Windows for Scrolling

When you open a new window on the same worksheet, you can link it to the existing window using the Window Link command. When windows are linked, the contents of the two windows scroll together. If the window split is horizontal, the synchronized scrolling is horizontal. If the window split is vertical, the synchronized scrolling is vertical. Linking windows is different from linking worksheets since data is not transferred from one window to another.

You can link or unlink windows for scrolling on a single worksheet at any time. You cannot use the Window Link command to scroll windows from different worksheets together. If you want to clear a linked window or load a new worksheet into a linked window, you must first unlink the window.

To link or unlink windows

1. Choose Window.
2. Choose Link.
3. In the "window number" and "with window number" fields, type the numbers of the windows you want to link.

   You can link only windows that share a horizontal or vertical edge.
4. Press Tab to move to the "linked" field, and select Yes or No depending on whether you want to link or unlink the windows.
5. Press Enter.

Fixing Headings in Place

You can use the Window Split Titles command to fix row or column headings in place so they remain visible no matter how far you scroll on the worksheet. Multiplan fixes headings in place by placing them in their own window. Once headings are fixed, you can scroll through the information in your worksheet, while keeping the headings in view.

Fixed headings are most useful when you're working in one window only.

To fix headings in place

1. Move the cell pointer to the row (or column) immediately adjacent to the row (or column) you want to fix in place.

   For example, if your headings are in column 1, move the cell pointer to the top of column 2.
2. Choose Window.
3. Choose Split.
4. Choose Titles.
5. If your headings are in columns, type **0** (zero) in the "# of rows" field to split the window vertically.

   If your headings are in rows, type the number of rows you want Multiplan to reserve for your headings (usually 1) in the "# of rows" field.
6. Press Tab.
7. If your headings are in columns, type the number of columns you want Multiplan to reserve for your headings (usually 1) in the "# of columns" field.

   If your headings are in rows, type **0** in the "# of columns" field to split the window horizontally.
8. Press Enter.

Example You can fix the headings for Sales, Costs, and Gross Profits on the SPENCER1.MOD worksheet while scrolling through the months to the right.

1. Load the SPENCER1.MOD worksheet and move the cell pointer to R1C2.

   The example files are on the Setup disk; run the SETUP program to copy the files, if you haven't already done so.
2. Choose Window.
3. Choose Split.
4. Choose Titles.

   Multiplan proposes row 0 and column 1.

```
WINDOW SPLIT TITLES  # of rows: 0   # of columns: 1

Enter number
R1C2      "January"                ? ! 100% Free    Multiplan      SPENCER1.MOD
```

The headings are in one column, so the proposed split at 0 rows and 1 column is correct to keep the headings in a fixed position.

5. Press Enter to accept the proposed responses.
6. Move the cell pointer to R1C15.

The row headings are fixed in window #1.

The rest of the worksheet is in window #2.

```
#1        1        #2      11        12        13        14        15
                           October   November  December  Sum
 1
 2
 3 Sales                   $21,874   $22,092   $22,313   $253,650
 4
 5 Costs
 6        Material         $4,000    $4,000    $4,000
 7          Labor          $7,000    $7,000    $7,000
 8        Overhead         $4,000    $4,000    $4,000
 9                         ---------------------------
10    Total Costs          $15,000   $15,000   $15,000   $180,000
11
12 Gross Profits           $6,874    $7,092    $7,313    $73,650
13
14
```

The contents of window #2 scroll while window #1 remains fixed.

7. Clear the worksheet or quit Multiplan without saving your changes. Choose Transfer Clear All and press N, or choose Quit and press N.

Adding Borders to Windows

A window **border** is a line drawn around a window to set it off from other windows.

To add or remove a window border

Choose Window.

Choose Border.

In the "change border in window number" field, type the number of the window you want to add a border to or the window you want to remove the border from.

Press Enter.

If you split a window that has a border, the new window will also have a border.

Example You can add a border to a window on the SPENCER1.MOD worksheet.

1 Load the SPENCER1.MOD worksheet.

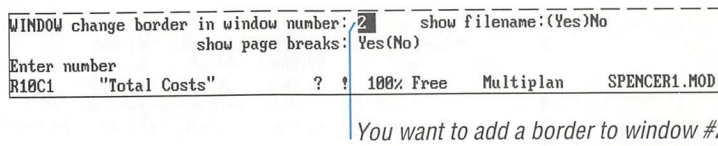
The example files are on the Setup disk; run the SETUP program to copy the files, if you haven't already done so.

2 Split the window horizontally at row 10.

3 Choose Window.

4 Choose Border.

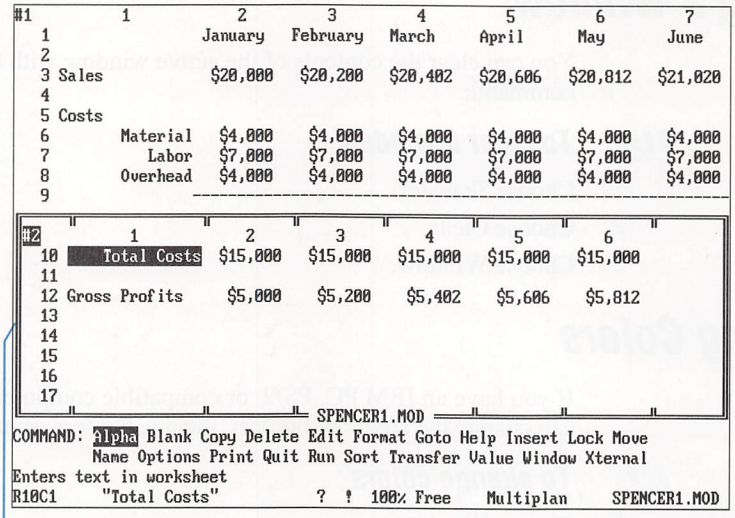
Multiplan proposes window #2.



You want to add a border to window #2.

5 Press Enter to accept the proposed responses.

Multiplan adds a border to the new window.



Multiplan uses a double line as a window border.

6 Clear the worksheet or quit Multiplan without saving your changes. Choose Transfer Clear All and press N, or choose Quit and press N.

Closing a Window

When multiple windows are open, you can use the Window Close command to close any open window.

To close a window

1 Choose Window.
2 Choose Close.
3 In the "window number" field, type the window number you want to close.
4 Press Enter.

Clearing a Window

You can clear the contents of the active window with the Transfer Clear Window command.

To clear a window

1. Choose Transfer.
2. Choose Clear.
3. Choose Window.

Changing Colors

If you have an IBM PC, PS/2, or compatible computer with a color monitor, you can change the colors of borders, menus, the foreground, and the background.

To change colors

1. Choose Window.
2. Choose Paint.
3. In the "foreground" field, type a color code for the color you want, or press the Right Arrow or Left Arrow key to see the effect of different color choices.

   Color codes are listed in the table on the following page.
4. Press Tab to move to the "background" field, and type a color code for the color you want, or press the Right Arrow or Left Arrow key.
5. Press Tab to move to the "border" field, and type a color code for borders, or press the Right Arrow or Left Arrow key.
6. Press Tab to move to the "menu" field, and type a color code for command menus, or press the Right Arrow or Left Arrow key.
7. Press Enter.



To change colors with the mouse, point to the fields in the Window Paint command and click the right mouse button.

The color codes are as listed in the following table:

Color code	Color
0	Black
1	Blue
2	Green
3	Cyan
4	Red
5	Magenta
6	Yellow
7	White

For more information on colors, see "Window Paint" in Chapter 13, "Commands."

Displaying Multiple Worksheets

With Multiplan you can display up to eight worksheets at the same time, depending on the amount of memory in your computer and the size of each worksheet. As you open new windows, you can create each of the worksheets in the windows, or you can load existing worksheets into windows.

To display multiple worksheets

1. Load or create the first worksheet.
2. Move the cell pointer to where you want to split the current window and open a new one for the second worksheet.
3. Choose Window.
4. Choose Split.
5. Choose Horizontal or Vertical depending on which direction you want Multiplan to split the screen.
6. In the "at row" or "at column" field, type the number of the row or column where you want to split the window.

   Multiplan proposes the location of the cell pointer.
7. Press Enter.

   The new window is the active window.
8. Choose Transfer.
9. Choose Load to load an existing worksheet and press Enter, or choose Clear Window to create a new worksheet.

   Repeat steps 2 through 9 to open more windows.

NOTE If you try to load a worksheet that is already loaded, Multiplan does not load the worksheet a second time, but treats the new window just as if you chose the Window Split command.

To move between worksheets

1. Choose Goto.
2. Choose Window.
3. In the "window number," "row," and "column" fields, enter the window number, row, and column you want to move to.

   You can also move from window to window by pressing F1 to move to the next window and Shift+F1 to move to the previous window.



You can move between windows with a mouse by clicking any cell in a window.

Only one of the open windows can be active at a time. The cell pointer is in the active window, and the active window's number indicator, in the upper-left corner of the worksheet, is highlighted. Most commands affect only the worksheet in the active window.

Copying from One Worksheet to Another

When multiple worksheets are displayed, you can copy information from one open worksheet to another using the Copy From command. This command differs from the External Copy command since both worksheets must be open to complete the copy.

To copy from one worksheet to another

1. Load each worksheet in a separate window.
2. Choose Copy.
3. Choose From.
4. Press Del to clear the proposed response in the "cells" field.
5. Type the number of the window you want to copy from, followed by a colon (for example, **1:**).

   You can also press F1 or Shift+F1 or click a window with the mouse to move the cell pointer to the next window and insert that window number in the "cells" field.
6. Type the absolute cell references or select the range of cells you want to copy.

   You cannot use relative references when copying from one worksheet to another.

7 Press Tab to move to the "to cells" field, and press Del to clear the proposed response.

8 Type the number of the window that you want to copy to, followed by a colon (for example, **2:**).

9 Type the cell reference or move the cell pointer to the cell (or to the upper-left corner of the range of cells) that you want to copy to.

10 Press Enter.

Multiplan copies the information from the first window to the second window.

Example You can copy information from the SPENCER1.MOD worksheet to a new worksheet.

1 Load the SPENCER1.MOD worksheet and add a border to the window.

The example files are on the Setup disk; run the SETUP program to copy the files, if you haven't already done so.

2 Split the window vertically at column 3.

3 Choose Transfer.

4 Choose Clear.

5 Choose Window.

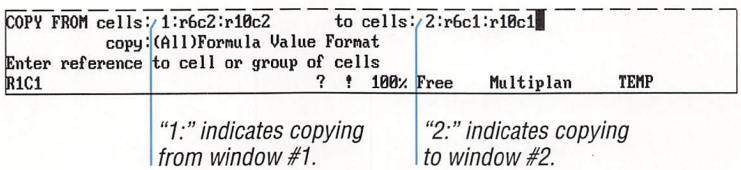
Multiplan opens a new worksheet named TEMP.

6 Choose Copy.

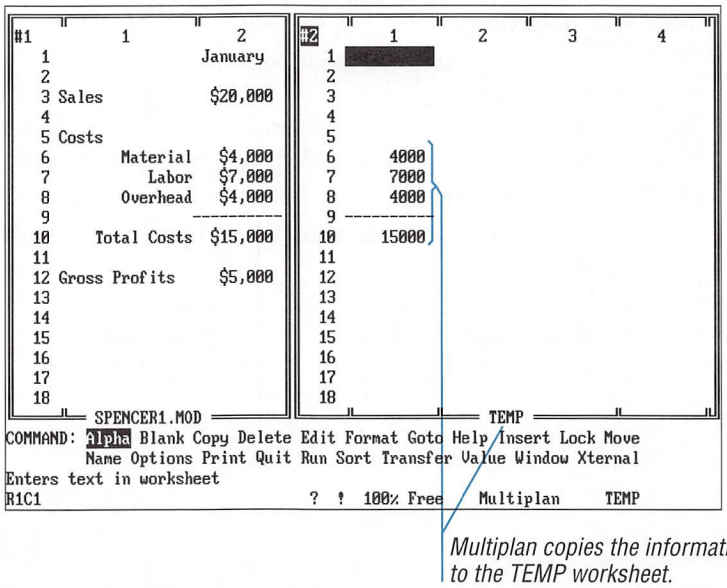
7 Choose From and follow these steps:

- in the "cell" field, press Del and type **1:r6c2:r10c2**
- in the "to cells" field, press Del and type **2:r6c1:r10c1**

You can also use the cell pointer or the mouse to define the ranges.



8 Press Enter.



9 Clear the worksheet or quit Multiplan without saving your changes. Choose Transfer Clear All and press N, or choose Quit and press N.

6 Dates, Times, and Custom Formats

With Multiplan, you can enter dates and times and make calculations with them. For example, you can calculate depreciation of assets over time, prepare accounts receivable charts, do order entry and inventory tracking, and compute payroll information. You can also display dates, times, and other information with predefined formats, or you can create your own custom formats.

This chapter explains how to:

- Display the current date and time.
- Select a predefined date or time format.
- Enter dates and times.
- Create custom formats.
- Change formats throughout the worksheet.
- Use dates and times in formulas.

Displaying the Current Date and Time

Multiplan stores dates and times as **serial numbers**. The integer part of a serial number represents dates, and the decimal part represents times. A serial number for a date is a number from 1 to 65380, where 1 is the number for January 1, 1900, and 65380 is the number for December 31, 2078. To store times, Multiplan assigns a decimal serial number to each second during the day so that 0 is the number for 12:00:00 midnight, 0.5 is the number for 12:00:00 noon, and 0.999 is the number for just before 12:00:00 midnight.

Multiplan handles all serial number operations for you, so you don't have to count the days from January 1, 1900, to get the current date—Multiplan does it for you.

To display the current date and time as a serial number

1. Press =
2. Type **now()**
3. Press Enter.

The NOW function generates a serial number. You will probably want to format the serial number so that it appears as a date or time using the Format Cells command. The serial number corresponds to the date and time when you first enter the NOW function. Every time the worksheet is recalculated, the date and time are updated. (To recalculate, press F4 or click the ! icon in the status line.) For information on recalculation, see "Options" in Chapter 13, "Commands."

Selecting Date and Time Formats

You do not usually want to display dates or times as serial numbers, but as months, days, years, hours, minutes, or seconds.

To format a serial number as a date or time

1. Choose Format.
2. Choose Cells.
3. Select or type the range you want to format.
4. Press Tab twice to move to the "format" field, and press a direction key to display the available formats.
5. Select one of the predefined time and date formats.

   The date and time formats are on the right half of the screen.
6. Press Enter.

Date and Time Formats

The following table shows how Multiplan's predefined time and date formats display the date and time "March 21, 1990, 18:45:01."

Format	Example
m/d/yy	3/21/90
m/d	3/21
d-mmm-yy	21-Mar-90
d-mmm	21-Mar
mmm-yy	Mar-90
h:mm AM/PM	6:45 PM
h:mm:ss AM/PM	6:45:01 AM
h:mm	18:45
h:mm:ss	18:45:01
m/d/yy h:mm	3/21/90 18:45

NOTE You may have other predefined date and time formats available depending on the country code setting in your CONFIG.SYS file. For more information on country codes, see "Using the International Display Option" in the "Getting Started" chapter, or see your DOS or OS/2 manual.

If you don't want to use one of Multiplan's predefined formats, you can mix and match the symbols in the left column of the preceding table to create a custom format. For more information on creating custom formats, and on what the letters and symbols in the date and time formats mean, see "Creating Custom Formats" later in this chapter. For more detailed information on custom formats, see "Format Cells" in Chapter 13, "Commands."

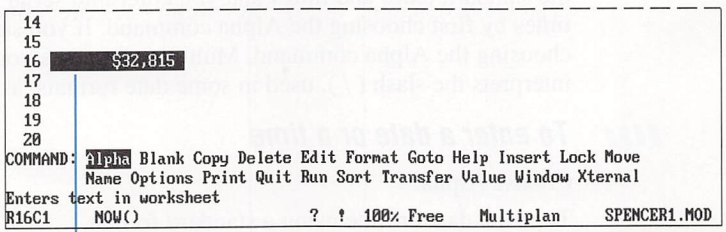
Example You can display the current date on the SPENCER1.MOD worksheet and format it using one of the standard formats.

1. Load the SPENCER1.MOD worksheet and move the cell pointer to R16C1.

   The example files are on the Setup disk; run the SETUP program to copy the files, if you haven't already done so.

2. Press = and type **now()**
3. Press Enter.

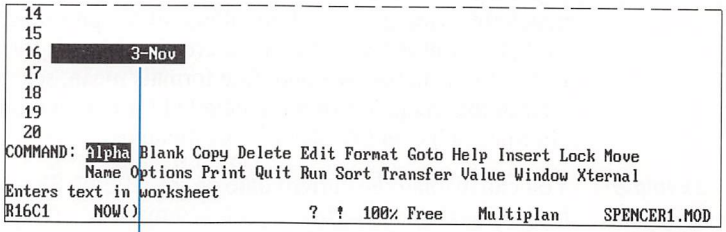
   The current date is displayed as a serial number and is formatted as a dollar value using the default format.



The current date is displayed as a serial number in currency format.

Display the serial number in a date format.

4. Choose Format.
5. Choose Cells.
6. In the "format" field, press a direction key to display the list of formats.
7. Select the d-mmm format.
8. Press Enter.



Multiplan displays the serial number in the date format.

9 Clear the worksheet or quit Multiplan without saving your changes. Choose Transfer Clear All and press N, or choose Quit and press N.

Entering Dates and Times

You do not have to enter dates and times as serial numbers. Multiplan converts the standard dates and times that you enter into serial numbers. Enter dates and times by first choosing the Alpha command. If you start typing a date without choosing the Alpha command, Multiplan assumes you are entering numbers and interprets the slash (/), used in some date formats, as a division symbol.

To enter a date or a time

1 Choose Alpha.

2 Type the date or time using a standard format.

See the following section, "Standard Date and Time Formats," for a list of standard formats.

3 Press Enter.

If you need to enter several dates or times, the "hold alpha" feature in the Options command can save you time and keystrokes. For more information, see "Entering a List of Dates and Times" later in this chapter.

When you enter a date or time, the serial number appears in the status line. If the cell has not already been formatted, Multiplan automatically formats the cell to display the date or time in the format in which you enter it. If you enter a date or time into a cell that is already formatted with a date or time format, Multiplan uses the format already set up for that cell.

NOTE If you are in Alpha/Value mode, you can press the Spacebar to tell Multiplan you want to enter text, and then type a date or time. Multiplan removes any spaces that appear before a date or time if you use a standard format.

Standard Date and Time Formats

Multiplan can recognize dates and times only if you enter them in a standard format. The following table shows 4:48 PM on April 23, 1990, written in several possible standard formats.

Date formats	Time formats
4/23/90	4:48 PM
4/23	4:48:00 pm
23-Apr-90	16:48
23-apr	16:48:00
apr-90	

You can also enter date and time information in a combined format, for example, 4/23/90 16:48.

NOTE Multiplan may recognize other date and time formats as standard depending on the country code setting in your CONFIG.SYS file. For more information on country codes, see "Using the International Display Option" in the "Getting Started" chapter, or see your DOS or OS/2 manual.

Creating Custom Formats

Although the formats included with Multiplan are adequate for most applications, you may want text, a number, a date, or a time to appear in a specific format. You can create custom formats with the Format Cells command.

To create a custom format

1. Choose Format.
2. Choose Cells.
3. Select or type the range you want to apply the custom format to.
4. Press Tab twice to move to the "format" field, and type the symbols corresponding to the custom format you want create.

   The following tables list the custom format symbols related to dates and times.
5. Press Enter.

   Multiplan formats the cells with your custom format and adds your format to the list of formats, so you can apply it to other cells later without having to retype it.

   You can use the preceding procedure to create any custom format—for numbers, dates, times, and text. The following tables show only a few of the most common symbols used to create custom formats for dates and times. For a complete explanation of all the symbols you use to create custom formats, see "Format Cells" in Chapter 13, "Commands."

Date format symbol	What the format symbol displays
d	The day as a number without leading zeros
dd	The day as a number with leading zeros
ddd	The day as a three-letter abbreviation
dddd	The day as a full name
m	The month as a number without leading zeros
mm	The month as a number with leading zeros
mmm	The month as a three-letter abbreviation
mmmm	The month as a full name
yy	The year as a two-digit number
yyyy	The year as a four-digit number

Time format symbol	What the format symbol displays
h	The hour as a number without leading zeros
hh	The hour as a number with leading zeros. If the format contains AM or PM, the hour is based on the 12-hour clock; otherwise, the 24-hour clock.
m	The minute as a number without leading zeros
mm	The minute as a number with leading zeros. The m or mm must appear after an h or hh; otherwise, Multiplan displays the month, not the minute.
s	The second as a number without leading zeros
ss	The second as a number with leading zeros
AM/PM am/pm A/P a/p	The hour using a 12-hour clock along with the letters AM or PM (or am or pm, etc.)

You can use any combination of format symbols and text to create a custom format up to 32 characters long. The display from this format will vary in length. If you want to display a format symbol as text, you must enclose it in double quotation marks. You must also use double quotation marks around words that contain format symbols.

The following table shows examples of custom formats.

Custom format	Sample display
m/d/yyyy	6/1/1990
dddd, mmm dd, yyyy	Thursday, Jan 04, 1990
mmmm d, yyyy	June 10, 1990
"Date:" m/dd/yyyy	Date: 7/01/1990
hh"h", mm"m", ss"s"	16h, 48m, 00s
h.mm AM/PM	4.48 PM
hhmm dd mmmm yyyy	1845 21 March 1990
dddd h:mm	Friday 18:45

Changing Formats

The Format Replace command looks through the entire worksheet for the format you specify and replaces it with another format.

To replace all occurrences of a format with another format

1. Choose Format.
2. Choose Replace.
3. Press a direction key to display the list of formats, including any you have created.
4. Select the format you want to replace.
5. Press Tab to move to the "with" field, and press a direction key to display the list of formats.
6. Select a new format or type a new custom format.
7. Press Enter.

   Multiplan goes through the entire worksheet and replaces all occurrences of the original format with the new format.

   You can use the Format Replace command to change from any format to any other format, or to NONE (no format). However, you cannot change from NONE to another format.

Removing a Custom Format

Choosing Format Replace and replacing with NONE is similar to replacing with Default, except that when you replace a custom format with NONE, Multiplan removes the custom format from the list of formats. Replacing with Default does not remove the custom format from the list.

Entering Dates and Times as Text

Normally, you enter a date or time by choosing the Alpha command and typing the information in a standard format. Multiplan automatically interprets the numbers and letters as a date or time and converts them to the correct serial number. If you enter a date or time in a nonstandard format, Multiplan interprets what you type as text.

Another way to have Multiplan interpret your date or time as text (not a serial number) is to choose the Value command and enclose the date or time in double quotation marks (""). If you forget the quotation marks, Multiplan treats the entry as a value and interprets the slash (/), used in some date formats, as a division symbol.

Entering a List of Dates and Times

If you need to enter dates and times into several contiguous cells, you can have Multiplan automatically choose the Alpha command and move the cell pointer every time you enter new information. The two procedures below explain how to enter dates and times quickly; you can follow these procedures to enter other kinds of information quickly, too.

Follow the first procedure to enter information with the direction keys. Follow the second to enter information with the Enter key. If you prefer to keep NumLock on, and if your direction keys are not separate from the number pad, then it is more convenient to use the Enter key.

To enter several dates and times with direction keys

1. Choose Options.
2. Press Tab repeatedly to move to the "hold alpha" field, and press Y to select Yes.
3. Press Enter.
4. Choose Alpha.
5. Type a date or time using a standard format.

   Refer to the table in "Standard Date and Time Formats" earlier in this chapter.
6. Press a direction key to enter the date or time and to move the cell pointer.

   Multiplan now displays the Alpha command because you selected Yes in the "hold alpha" field.
7. Continue entering dates and times with the direction keys.
8. After you type the last date or time, press Enter to return to the main menu.

   You may want to choose Options and select No in the "hold alpha" field.

For more information on the "hold alpha" field, see "Options" in Chapter 13, "Commands."

To enter several dates and times with the Enter key

1. Choose Options.
2. Press Tab repeatedly to move to the "learn" field, and press Y to select Yes.
3. Press Tab twice to move to the "hold alpha" field, and press Y to select Yes.
4. Press Enter.
5. Choose Alpha.
6. Type a date or time using a standard format.

   Refer to the table in "Standard Date and Time Formats" earlier in this chapter.
7. Press a direction key to enter the information and move the cell pointer.

   Multiplan now displays the Alpha command because you selected Yes in the "hold alpha" field. This is the only time you need to press a direction key.
8. Continue entering dates and times, pressing Enter after each one.

   Multiplan automatically moves the cell pointer in the same direction as the last direction key you pressed.
9. Press Esc when you are ready to return to the main menu.

   You may want to choose Options and select No in the "learn" and "hold alpha" fields.

   For more information on the "learn" and "hold alpha" fields, see "Options" in Chapter 13, "Commands."

NOTE Multiplan saves the "learn" and "hold alpha" settings in the MP.INI file when you quit Multiplan. The next time you start Multiplan, these settings are in use. For more information, see "The MP.INI File" in Appendix C, "Tips and Additional Information About Multiplan."

Using Dates and Times in Formulas

Because Multiplan stores dates and times as serial numbers, you can use dates and times in formulas just as you would use any other value. For example, you can calculate the number of days between dates or find out when bills are past due.

Example Spencer Ceramics has been tracking the performance of five new items. The SPENCER3.MOD worksheet shows the date and when the items began selling. Multiplan calculates the number of days that have elapsed since the product began selling. Multiplan also calculates the average daily revenue by dividing the revenue for each item by the number of elapsed days for each item.

The illustration in this example shows Nov. 3 as the current date. Because the NOW function is used, the date and certain numbers on the worksheet will vary when you perform the example.

1 Load the SPENCER3.MOD worksheet and move the cell pointer to R8C2.

The example files are on the Setup disk; run the SETUP program to copy the files, if you haven't already done so.

2 Press F4 to recalculate the worksheet.

3 Choose Alpha repeatedly and enter the following dates:

- in R8C2, type **2/15**
- in R9C2, type **2/15**
- in R10C2, type **9/13**
- in R11C2, type **10/23**
- in R12C2, type **10/31**

The formula in this cell is NOW() +365. The NOW function generates a serial number representing the current date.

#1	1	2	3	4	5	6	7
1							
2							
3							
4			Today's date:	03-Nov			
5							
6	Item	Began	Elapsed	Units	Price	Revenues	Average daily
7	number	selling	days	sold			revenues
8	1	15-Feb	261	15	$19	$285	$1.09
9	2	15-Feb	261	27	$22	$594	$2.28
10	3	13-Sep	51	19	$5	$95	$1.86
11	4	23-Oct	11	155	$3	$465	$42.27
12	5	31-Oct	3	7	$57	$399	$133.00
13							
14	Total Revenues:		$1,838				
15							
16							

The formula in these cells calculates the elapsed days between the current date and the date the items began selling.

The formula in these cells calculates the average daily revenues by dividing the revenues by the elapsed days.

You can use the Edit command to see the formulas used on this worksheet.

4 Clear the worksheet or quit Multiplan without saving your changes. Choose Transfer Clear All and press N, or choose Quit and press N.

Using the DATE and TIME Functions

You can use the DATE and TIME functions to calculate serial numbers from dates and times without having to enter the dates and times in a cell yourself. These functions allow you to work with actual dates and times in formulas.

The DATE function takes the year, month, and day you specify, and translates them into a serial number that Multiplan can then use in a calculation. The DATE function produces the same result as INT(NOW()), where INT is a function that removes the decimal part of the number returned by the NOW function.

The DATE function can interpret some invalid dates as the correct date. For example, if you make a mistake and type DATE(1990,11,31), the DATE function

calculates with the date December 1, 1990, rather than November 31, 1990 (an invalid date). Similarly, DATE(1990,12,32) is interpreted as January 1, 1991.

The TIME function works like the DATE function: it takes the hour, minute, and second you specify and turns it into the decimal part of a serial number that you can then use in a formula.

For more information on the DATE and TIME functions, see Chapter 14, "Formulas and Functions."

Using Other Date and Time Functions

Multiplan has a number of functions that work with dates and times. Here is a list of some of Multiplan's date and time functions.

The function	Produces
DATE(*year,month,day*)	The serial number of the date specified
DATEVALUE(*text*)	The serial number of the date that is written as *text*
DAY(*serial-number*)	The number of the day in the date specified by *serial-number*
HOUR(*serial-number*)	The hour specified by *serial-number*
MINUTE(*serial-number*)	The minute specified by *serial-number*
MONTH(*serial-number*)	The number of the month in the date specified by *serial-number*
NOW()	The serial number of the current date and time
SECOND(*serial-number*)	The second specified by *serial-number*
TIME(*hour,minute,second*)	The serial number of the time specified
TIMEVALUE(*text*)	The serial number of the time that is written as *text*
WEEKDAY(*serial-number*)	The number of the weekday in the date specified by *serial-number*
YEAR(*serial-number*)	The number of the year in the date specified by *serial-number*

You enter all functions with the Value command. For more information on the functions in this list and on other date and time functions, see Chapter 14, "Formulas and Functions."

7 Conditional Formulas

With Multiplan, you can build **conditional formulas**. Conditional formulas test a condition and then perform an action based on the result of the test.

This chapter explains how to:

- Use the IF function.
- Use conditional functions.

Every time you make a decision, you must set conditions and choose one of several outcomes. For example, you might think to yourself, "If sales decrease, I'll spend more money on advertising; otherwise, I'll buy more office equipment." This is a conditional formula. Conditional formulas start with "If," followed by a condition to test, followed by one or more actions to perform based on the result of the test.

You use the IF function to set up conditional formulas in Multiplan.

The IF Function

With the IF function, you can build conditional formulas, that is, formulas that evaluate a condition and perform an action based on the result. A conditional formula in Multiplan takes the following form:

IF (*test, action if true, action if false*)

Test is the condition you want Multiplan to evaluate. *Action if true* is the action you want Multiplan to take if the condition is true, and *action if false* is the action you want Multiplan to take if the condition is false. You can use cell references, values, names, text, or other functions as the action to be taken. You can even use other conditional formulas.

Don't forget that when you enter an IF function into a cell, you must first type = (an equal sign), just as you do when you build any formula. For more information on the IF function, see Chapter 14, "Formulas and Functions." If you need to review how to use functions, see "Entering Functions into Formulas" and "Notation of Arguments" in Chapter 14, "Formulas and Functions."

Logical Operators

Logical operators are symbols that tell Multiplan how to evaluate a test. You use logical operators to tell the IF function what to check for.

These are the logical operators you use to define the condition that Multiplan evaluates:

Logical operator	Meaning
=	Is equal to
<	Is less than
>	Is greater than
<=	Is less than or equal to
>=	Is greater than or equal to
<>	Is not equal to

Example Suppose that Spencer Ceramics is thinking about instituting a profit-sharing plan for the new year. Whenever gross profits go over $5,500, 5% of the gross profit will be distributed to the employees.

This is what you want Multiplan to do: for each month, if Gross Profits is greater than $5,500 (this is the "test"), then display 5% of the gross profit (this is the "action if true"); otherwise, display $0 (this is the "action if false").

On the example worksheet, you'll add the profit-sharing information and two rows under Gross Profits. When you translate the conditional task into a conditional formula using the IF function, it looks like this:

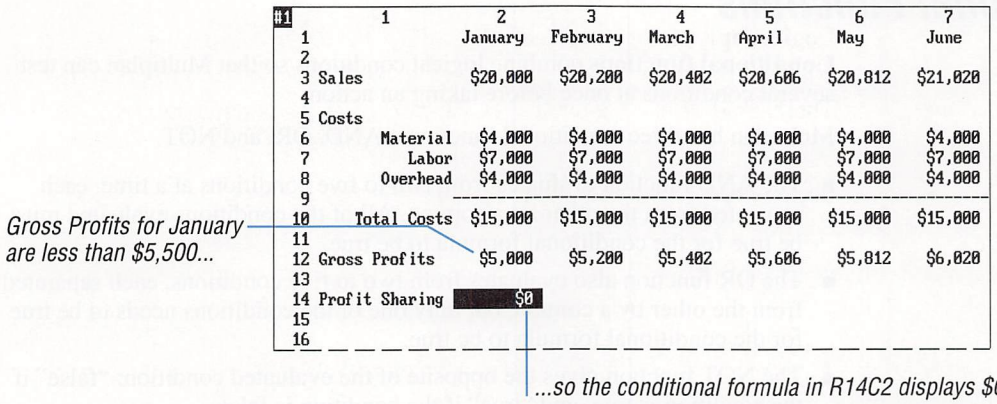
IF(R[–2]C>5500,R[–2]C*5%,0)

Or, if the cell two rows up is greater than 5500, multiply the cell two rows up by 5% and display this amount in the cell containing the formula; otherwise, display 0.

1. Load SPENCER1.MOD worksheet and move the cell pointer to R14C1.

   The example files are on the Setup disk; run the SETUP program to copy the files, if you haven't already done so.
2. Choose Alpha.
3. Type **Profit Sharing**
4. Press Enter.
5. Move the cell pointer to R14C2.
6. Press = and type the conditional formula: **if(r[-2]c>5500,r[-2]c*5%,0)**
7. Press Enter.

   Multiplan cannot display all of the formula in the status line. To see the entire formula, choose the Edit command.



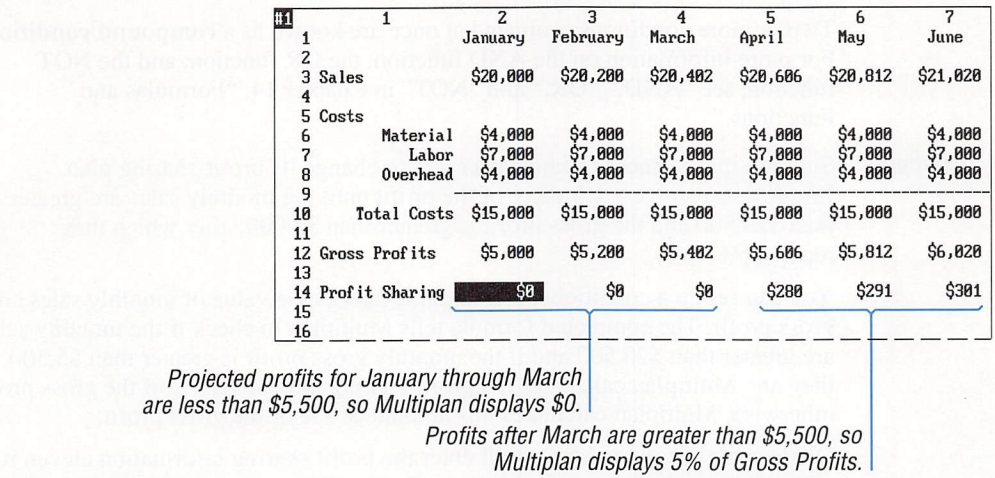
	1	2	3	4	5	6	7
1		January	February	March	April	May	June
2							
3	Sales	$20,000	$20,200	$20,402	$20,606	$20,812	$21,020
4							
5	Costs						
6	Material	$4,000	$4,000	$4,000	$4,000	$4,000	$4,000
7	Labor	$7,000	$7,000	$7,000	$7,000	$7,000	$7,000
8	Overhead	$4,000	$4,000	$4,000	$4,000	$4,000	$4,000
9							
10	Total Costs	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000
11							
12	Gross Profits	$5,000	$5,200	$5,402	$5,606	$5,812	$6,020
13							
14	Profit Sharing	$0					
15							
16							

Gross Profits for January are less than $5,500...

...so the conditional formula in R14C2 displays $0.

8 Choose Copy.

9 Choose Right and copy the formula 11 cells to the right.



	1	2	3	4	5	6	7
1		January	February	March	April	May	June
2							
3	Sales	$20,000	$20,200	$20,402	$20,606	$20,812	$21,020
4							
5	Costs						
6	Material	$4,000	$4,000	$4,000	$4,000	$4,000	$4,000
7	Labor	$7,000	$7,000	$7,000	$7,000	$7,000	$7,000
8	Overhead	$4,000	$4,000	$4,000	$4,000	$4,000	$4,000
9							
10	Total Costs	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000
11							
12	Gross Profits	$5,000	$5,200	$5,402	$5,606	$5,812	$6,020
13							
14	Profit Sharing	$0	$0	$0	$280	$291	$301
15							
16							

Projected profits for January through March are less than $5,500, so Multiplan displays $0.

Profits after March are greater than $5,500, so Multiplan displays 5% of Gross Profits.

10 Clear the worksheet or quit Multiplan without saving your changes. Choose Transfer Clear All and press N, or choose Quit and press N.

Conditional Functions

Conditional functions combine logical conditions so that Multiplan can test several conditions at once before taking an action.

Multiplan has three conditional functions: AND, OR, and NOT.

- The AND function evaluates from two to five conditions at a time, each separated from the other by a comma. All of the conditions evaluated must be true for the conditional formula to be true.
- The OR function also evaluates from two to five conditions, each separated from the other by a comma, but only one of the conditions needs to be true for the conditional formula to be true.
- The NOT function gives the opposite of the evaluated condition: "false" if the condition is true, and "true" if the condition is false.

You use conditional functions primarily within the IF function, but you can set up a conditional function in one cell, and then refer to that cell by its cell reference or name. This is useful if you are checking the same conditions in several places.

Two or more conditions evaluated at once are known as a **compound condition**. For more information on the AND function, the OR function, and the NOT function, see "AND," "OR," and "NOT" in Chapter 14, "Formulas and Functions."

Example Suppose that Spencer Ceramics decides to change its profit-sharing plan. Employees receive a 4% share of the profit until the monthly sales are greater than $20,500 and the gross profit is greater than $5,000, after which they receive 6%.

You can set up a conditional formula that checks the value of monthly sales and gross profit. The completed formula tells Multiplan to check if the monthly sales are greater than $20,500 and if the monthly gross profit is greater than $5,500. If they are, Multiplan calculates the profit-sharing amount as 6% of the gross profit; otherwise, Multiplan calculates this amount as 4% of the gross profit.

On the example worksheet you'll enter the profit sharing information eleven rows under Sales and two rows under Gross Profits. When you translate the conditional task into a conditional formula composed of the IF and AND functions, it looks like this:

IF(AND(R[–11]C>20500,R[–2]C>5500),R[–2]*6%,R[–2]*4%)

Or, if the cell eleven rows up is greater than 20500 and if the cell two rows up is greater than 5500, then multiply the cell two rows up by 6% and display this amount in the cell containing the formula; otherwise multiply the cell two rows up by 4%.

1 Load the SPENCER1.MOD worksheet and move the cell pointer to R14C1.

The example files are on the Setup disk; run the SETUP program to copy the files, if you haven't already done so.

2 Choose Alpha.

3 Type **Profit Sharing**

4 Press Enter.

5 Move the cell pointer to R14C2.

6 Press = and type the conditional formula:
if(and(r[-11]c>20500,r[-2]c>5500),r[-2]*6%,r[-2]*4%)

7 Press Enter.

Multiplan cannot display all of the formula in the status line. To see the entire formula, choose the Edit command.

8 Choose Copy.

9 Choose Right and copy the formula 11 cells to the right.

#1	1	2	3	4	5	6	7
1		January	February	March	April	May	June
2							
3	Sales	$20,000	$20,200	$20,402	$20,606	$20,812	$21,020
4							
5	Costs						
6	Material	$4,000	$4,000	$4,000	$4,000	$4,000	$4,000
7	Labor	$7,000	$7,000	$7,000	$7,000	$7,000	$7,000
8	Overhead	$4,000	$4,000	$4,000	$4,000	$4,000	$4,000
9							
10	Total Costs	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000
11							
12	Gross Profits	$5,000	$5,200	$5,402	$5,606	$5,812	$6,020
13							
14	Profit Sharing	$200	$208	$216	$336	$349	$361
15							
16							

Multiplan displays 6% of the gross profits if both conditions in the AND function are true.

The profit-sharing amounts are 4% of the gross profits for January through March. In April, the projected sales are over $20,500 and the gross profits are over $5,500, so the profit-sharing amount is 6% of the gross profits.

10 Clear the worksheet or quit Multiplan without saving your changes. Choose Transfer Clear All and press N, or choose Quit and press N.

Combining Conditional Functions

You can combine conditional functions. For example, if you wanted to test cell R12C2 for being between $10,000 and $15,000 (that is, neither greater than $15,000 nor less than $10,000), the condition in your formula would be:

NOT(OR(R12C2>15000,R12C2<10000))

Referring to Conditional Functions

You can set up a conditional function in one cell, and then refer to that cell by its cell reference or even a name. This is very useful if you are checking the same conditions in several places.

For example, you could set up the AND condition in the profit-sharing equation in a separate cell, name the cell "EmployeeShare," and refer to EmployeeShare in all the equations. You could then try different profit-sharing equations by typing in different conditions in the cell named EmployeeShare.

8 Tables

A **table** is an organized group of information in which you can look up specific values, such as tax rates, commissions, or the results of complex math formulas that would take too long to calculate repeatedly.

This chapter explains how to:

- Create a table.
- Extract information from a table using the LOOKUP function.

Creating a Table

The information in tables is organized in rows and columns. Tax tables, phone lists, and inventory lists are all examples of tables.

To create a table

1. Type the information in rows and columns.
2. Choose Name.
3. In the "define name" field, type the name of the table.
4. Press Tab to move to the "to refer to" field, and select or type the range of the contents within the table. Do not select headings or lines.
5. Press Enter.

The LOOKUP Function

A **search value** is used to find the value you want to look up in a table. For example, when you look up someone's telephone number in a phone book, you are using the person's name as the search value.

Multiplan can use numbers as search values to find other information. For example, you could look up a vendor number to obtain the vendor's name and address.

You extract information from a table with the LOOKUP function. The syntax for the LOOKUP function is LOOKUP(*search-value,table*). The LOOKUP function searches *table* for the greatest value that is less than or equal to *search-value,* and then it returns the contents of a cell from the last row or column in *table*. For more information on the LOOKUP function, see "LOOKUP" in Chapter 14, "Formulas and Functions."

NOTE When you are setting up tables, it is a good idea to make some sample entries to be sure that the table gives the values you expect.

Example Spencer Ceramics must pay local taxes on gross profits. You can use the tax rates in a table on the SPENCER1.MOD worksheet and then use the LOOKUP function to extract the tax rate. Then you can multiply the tax rate and the gross profits to calculate the local tax. You will place Local Tax Due two rows below Gross Profits, so the formula to calculate the local tax is:

LOOKUP(R[–2]C,Tax_Table)*R[–2]C

First define the table, and then use the LOOKUP formula to compute the tax.

1 Load the SPENCER1.MOD worksheet and move the cell pointer to R57C1.

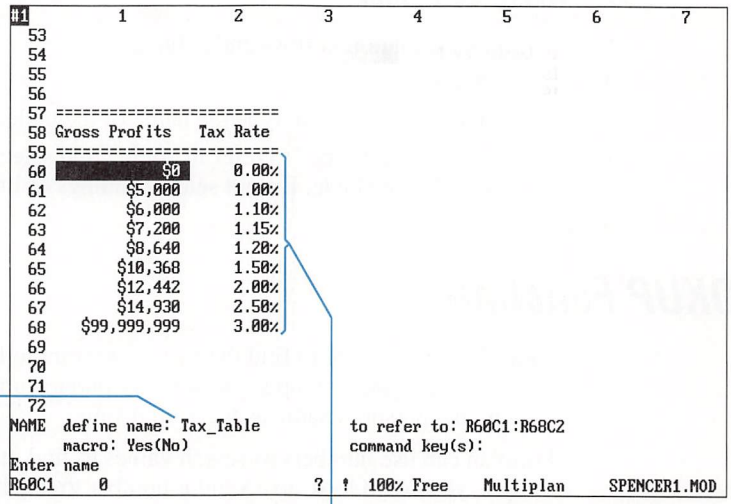
The example files are on the Setup disk; run the SETUP program to copy the files, if you haven't already done so.

2 Select the tax information in R60C1:R68C2 as a range.

Do not select the headings or lines.

3 Choose Name and name the selection **Tax_Table**

Name the range Tax Table by choosing the Name command.



Define the tax table as a range.

4 Press Enter.

5 Move the cell pointer to R14C1.

6 Choose Alpha.

7 Type **Local Tax Due**

8 Press Enter.

9 Move the cell pointer to R14C2.

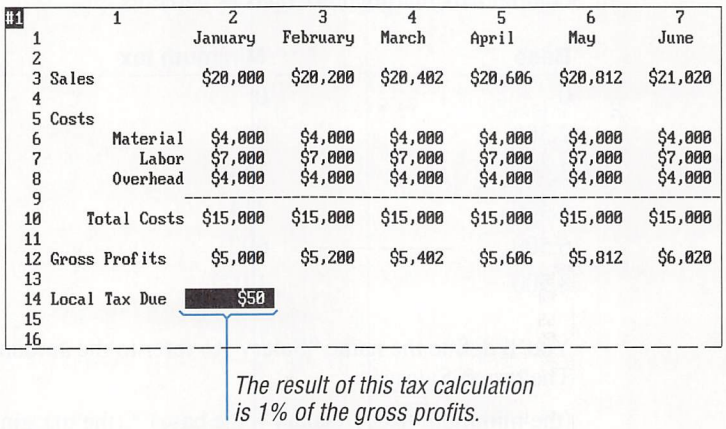
10 Press = and type the formula to calculate the local tax due:

lookup(r[-2]c,Tax_Table)*r[-2]c

11 Press Enter.

Multiplan cannot display all of the formula in the status line. Choose the Edit command to see the entire formula.

Multiplan calculates the tax in R14C2.

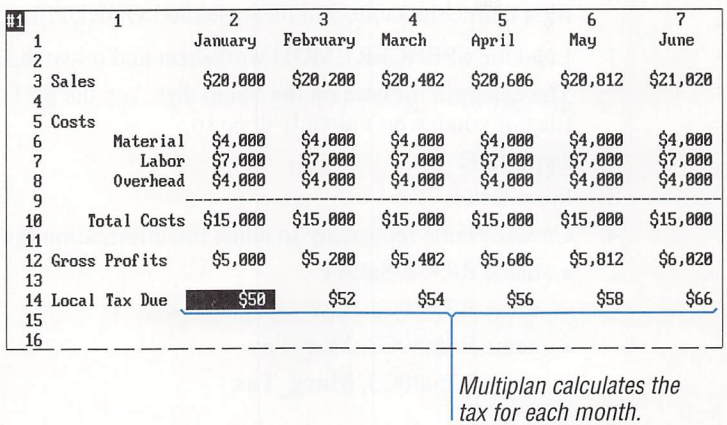


#1	1	2	3	4	5	6	7
1		January	February	March	April	May	June
2							
3	Sales	$20,000	$20,200	$20,402	$20,606	$20,812	$21,020
4							
5	Costs						
6	Material	$4,000	$4,000	$4,000	$4,000	$4,000	$4,000
7	Labor	$7,000	$7,000	$7,000	$7,000	$7,000	$7,000
8	Overhead	$4,000	$4,000	$4,000	$4,000	$4,000	$4,000
9							
10	Total Costs	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000
11							
12	Gross Profits	$5,000	$5,200	$5,402	$5,606	$5,812	$6,020
13							
14	Local Tax Due	$50					
15							
16							

The result of this tax calculation is 1% of the gross profits.

12 Choose Copy.

13 Choose Right and copy the formula 11 cells to the right.



#1	1	2	3	4	5	6	7
1		January	February	March	April	May	June
2							
3	Sales	$20,000	$20,200	$20,402	$20,606	$20,812	$21,020
4							
5	Costs						
6	Material	$4,000	$4,000	$4,000	$4,000	$4,000	$4,000
7	Labor	$7,000	$7,000	$7,000	$7,000	$7,000	$7,000
8	Overhead	$4,000	$4,000	$4,000	$4,000	$4,000	$4,000
9							
10	Total Costs	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000
11							
12	Gross Profits	$5,000	$5,200	$5,402	$5,606	$5,812	$6,020
13							
14	Local Tax Due	$50	$52	$54	$56	$58	$66
15							
16							

Multiplan calculates the tax for each month.

14 Clear the worksheet or quit Multiplan without saving your changes. Choose Transfer Clear All and press N, or choose Quit and press N.

Performing Multiple Lookups

You can use the result of one lookup to find another, that is, you can do multiple lookups in a single formula.

Example Last year, a summer worker earned $4,502 after 14 weeks at Spencer Ceramics. Compute taxes on the intern's salary using the following table included on the SPENCER1.MOD worksheet. The first column lists base salaries. The second column lists the minimum taxes for the salaries. The third column lists marginal tax rates as percents.

Base	Minimum tax	Marginal tax
0	0	0%
2,300	0	14%
3,400	154	16%
4,400	314	18%
6,500	692	19%
8,500	1,072	21%

You'll define the name "Salary" to refer to the amount the summer intern made. The tax on Salary is:

(the minimum tax) + (salary – the base) * (the marginal rate)

You can compute the tax using multiple lookups. The LOOKUP formula is:

LOOKUP(Salary,BASE:MIN_TAX)+(Salary–
LOOKUP(Salary,BASE))*LOOKUP(Salary,BASE:MARG_TAX)

First define the table, and then use the LOOKUP formula to compute the tax.

1 Load the SPENCER1.MOD worksheet and move the cell pointer to R83C2.

The example files are on the Setup disk; run the SETUP program to copy the files, if you haven't already done so.

2 Type **4502**

3 Press Enter.

4 Choose Name repeatedly to name the information in the following areas:

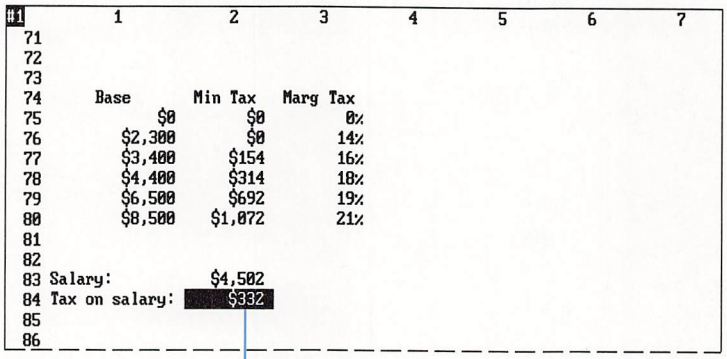
- name R83C2 **Salary**
- name R75:80C1 **Base**
- name R75:80C2, **Min_Tax**
- name R75:80C3, **Marg_Tax**

5 Move the cell pointer to R84C2, press = and type the formula:

lookup(Salary,Base:Min_Tax)+(Salary-lookup(Salary,Base))*lookup(Salary,Base:Marg_Tax)

6 Press Enter.

Multiplan cannot display all of the formula in the status line. Choose the Edit command to see the entire formula.



#1	1	2	3	4	5	6	7
71							
72							
73							
74	Base	Min Tax	Marg Tax				
75	$0	$0	0%				
76	$2,300	$0	14%				
77	$3,400	$154	16%				
78	$4,400	$314	18%				
79	$6,500	$692	19%				
80	$8,500	$1,072	21%				
81							
82							
83	Salary:	$4,502					
84	Tax on salary:	$332					
85							
86							

The result of the tax calculation appears in R84C2.

Notice that in the first lookup, you find the tax on the base salary (using Base to find a value in Min_Tax). In the second lookup, you find the actual base amount (using Base to find a value in itself; a table can be one column wide or one row high). In the third lookup, you find the marginal tax rate for the amount of the salary that exceeds the base amount (using BASE to find a value in Marg_Tax).

7 Clear the worksheet or quit Multiplan without saving your changes. Choose Transfer Clear All and press N, or choose Quit and press N.

You can also use the INDEX function to perform multiple lookups on tables. For more information about the LOOKUP and INDEX functions, see Chapter 14, "Formulas and Functions."

9 Running Macros

As you become experienced using Multiplan, you may find that you use the same keystrokes over and over. Or, you may want other people to enter data into a worksheet for you, but find you don't have the time to train them. You can save time and effort in such cases by writing and then running a **macro**.

A macro is a cell or group of cells containing a series of keystrokes that Multiplan performs as actions. You store the keystroke sequences that you use regularly. Then, instead of typing the keystroke sequence each time, you run the macro and let Multiplan do the work for you.

This chapter explains how to:

- Create, name, run, and find macros.
- Use keycodes in macros.
- Run macros with multiple worksheets.
- Check your macros.
- Record macros automatically.
- Make macros interactive.
- Create an AUTOEXEC macro.
- Use command codes.
- Put your knowledge of macros to work.

Creating and Using a Macro

Use macros whenever you must do the same task a number of times. With just a few keystrokes, you can run macros to perform procedures that might involve hundreds of manual keystrokes. For example, you could create an accounting macro to compare several worksheets to see if they balance; you could write the macro so that it would check the date and run only on certain days during the year.

You can create a macro by typing exactly what you want Multiplan to do, or you can record a macro as you perform a procedure. This section explains creating and using a typed macro. Instructions for recording a macro are given in the "Recording a Macro" section later in this chapter.

There are three steps in creating and using a macro:

- Enter the macro.
- Name the macro.
- Run the macro.

These three steps are explained in detail in this section.

Entering a Macro

Like headers and footers, macros do not need to be in the visible part of the worksheet, so you should place them away from the main worksheet area. Or you may want to put your macros on a separate worksheet and then open the separate worksheet as a second window, or link the separate worksheet to the main worksheet using the External Copy command. For more information on how to run macros from another worksheet, see "Running Macros with Multiple Worksheets" later in this chapter.

You enter macros as text using uppercase or lowercase characters. Each cell can hold up to 255 characters. If you use more than one cell for your macro, put each succeeding cell below the previous one. Multiplan reads macro cells downward in a column. If you have a large macro, break it into separate tasks and put each task in a separate cell in a single column. Macros separated this way are easier for you to test, understand, and change.

You can choose the Edit command to edit a macro the same way you edit the contents of any other cell. For information on editing cells, see the "Fundamentals" chapter, and "Edit" in Chapter 13, "Commands."

To enter a macro

1. Move the cell pointer to a remote area of your worksheet.
2. Choose Alpha.
3. Type the letters, symbols, and keycodes corresponding to the keystrokes you want Multiplan to follow.

   Keycodes are listed in the following table.
4. Press Enter.

WARNING When creating macros, do not leave blank spaces between the characters. Multiplan interprets a blank space in a macro as if you had pressed the Spacebar. The space can produce results different from those you intend. This warning does not apply to blank spaces before or after the macro, which Multiplan ignores.

Entering Keycodes

When you enter letters and numbers in a macro, Multiplan interprets them as you have typed them. But you can also tell Multiplan to tab, to backspace, or to move to the next unlocked cell using keycodes. A keycode is an apostrophe followed by two letters that represent keys you press on the keyboard.

You can enter keycodes by typing the apostrophe and the two-letter code using uppercase or lowercase characters, or you can use F5 (the edit macro key). When you press F5, Multiplan suspends the normal action of the keys and activates Edit Macro mode. As you press keys, Multiplan inserts their keycodes into the macro.

When you press F5 again, Multiplan resumes normal keyboard operation. The letters EM replace the word Multiplan in the status line when you are in Edit Macro mode.

You can enter the following keycodes in macros:

Action	Corresponding keys	Keycode
Up	Up Arrow	'UK
Down	Down Arrow	'DK
Left	Left Arrow	'LK
Right	Right Arrow	'RK
Next window	F1	'CW
Previous window	Shift+F1	'PW
Next unlocked cell	F2	'NU
Previous unlocked cell	Shift+F2	'PC
Page up	PgUp	'PU
Page down	PgDn	'PD
Page left	Ctrl+Left Arrow	'PL
Page right	Ctrl+Right Arrow	'PR
Home	Home	'HM
End	End	'EN
Home window	Ctrl+Home	'HW
Escape (Cancel)	Esc	'CN
Enter (Return)	Enter	'RT
Select next item	Spacebar or Tab	'SP
Select previous item	Backspace	'BS
Tab	Tab	'TB
Backtab	Shift+Tab	'PF
Help	?	'HP
Recalculate	F4	'RC
Delete	Del	'DL
Backspace	Backspace	'BS
Character left	F9	'CL
Character right	F10	'CR
Word left	F7	'WL
Word right	F8	'WR

(Continued on the next page)

Action	Corresponding keys	Keycode
Reference	F3	'RF
Refresh links	Shift+F6	'UD
Function enumeration	Shift+F3	'FE
Edit home	Shift+F8	'EH
Edit end	Shift+F10	'EE
Insert space	Spacebar	'SP
Insert quotation mark	"	'QT

Once you've entered a macro, you should name it before running the macro.

Naming a Macro

Once you enter a macro, you can name it with the Name command. You do not have to name a macro, but a named macro is easier to work with. You give a macro a name and also an optional one-letter or two-letter **command key sequence**. You press command key sequences in combination with Alt to run macros.

Naming macros is optional because you can identify any macro by the upper-left cell of the macro range. However, a named macro is easier to remember, and easier to find. When naming macros, use names that are associated with the action of the macro, and that are easy to remember.

To name a macro

1. Move the cell pointer to the upper-left cell of the macro range.
2. Choose Name.
3. In the "define name" field, type the name of the macro.
4. Press Tab to move to the "to refer to" field, and select a range.
5. Press Tab to move to the "macro" field, and press Y to select Yes and identify the named range as a macro.
6. Press Tab to move to the "command key(s)" field, and type a one-letter or two-letter command key sequence.
7. Press Enter.

To find a named macro, you can choose the Goto Name command and press a direction key to select from the list of defined names.

IMPORTANT Avoid using the letter "h" as the first letter of a command key sequence. If you assign a command key sequence that starts with "h" you will not be able to get help by pressing Alt+H.

Running a Macro

Once you have entered and named a macro, you can run it whenever you want. You can run a macro by pressing a command key sequence, or by choosing the Goto Macro command.

To run a macro with a command key sequence

► Press and hold Alt, and press the macro's command key sequence.

If you forget a command key sequence, choose the Name command and press a direction key to examine the list of macros. Multiplan displays command key sequences in the "command key(s)" field as you move the cursor.

To run a macro with the Goto Macro command

1. Choose Goto.
2. Choose Macro.
3. Type the name of the macro or press a direction key and select from the list of macros.
4. Press Enter.

You can stop running a macro at any time by pressing Esc.

Finding a Macro

If you need to find a named macro on your worksheet, you can choose the Goto Name command and search for it just as you would search for any named range.

To find a named macro

1. Choose Goto.
2. Choose Name.
3. Type the name of the macro or press a direction key to select from the list of macros.
4. Press Enter.

The cell pointer always goes to the first cell in the named area: the leftmost cell if the area is a row, the uppermost cell if it is a column, the upper-leftmost cell if it is a block of cells.

You can also go to a macro by scrolling or by choosing the Goto Row-col command. To find an unnamed macro, you must look for it manually.

NOTE You cannot use the Goto Macro command to go to a cell that contains a macro. The Goto Macro command performs the macro in the specified cell, but does not move the cell pointer to that cell.

Example The SPENCER1.MOD worksheet displays whole dollar amounts. Suppose that you often have to write a report that includes dollars and cents. Instead of choosing Format Default Cells to change to dollars and cents formatting, you can create a macro to change the formatting automatically.

1 Load the SPENCER1.MOD worksheet and move the cell pointer to R90C1, a remote area of the worksheet.

The example files are on the Setup disk; run the SETUP program to copy the files, if you haven't already done so.

2 Choose Alpha.

3 Type the following information:

- **fdc** (for Format Default Cells)
- **'tb** (for Tab)
- **'dl** (for Delete)
- **$0.00** (a custom format)
- **'rt** (for Enter)

```
ALPHA: fdc'tb'dl$0.00'rt
Enter text
R90C1                              ? ! 100% Free    Multiplan     SPENCER1.MOD
```

4 Press Enter.

5 Choose Name and enter the following information:

- in the "define name" field, type **Dollars_and_Cents**
- in the "macro" field, press Y to select Yes
- in the "command key(s)" field, type **dc**

```
NAME  define name: Dollars_and_Cents  to refer to: R90C1
      macro:(Yes)No                   command key(s): dc
Enter command key sequence
R90C1     "fdc'tb'dl$0.00'rt"     ? ! 100% Free    Multiplan     SPENCER1.MOD
```

When Yes is selected in the "macro" field, the named range is identified as a macro.

The macro in R90C1 is named Dollars and Cents.

DC is the command key sequence.

6 Press Enter.

7 Press Home.

8 Press Alt+DC to run the Dollars and Cents macro.

#1	1	2	3	4	5	6	7
1		January	February	March	April	May	June
2							
3	Sales	$20000.00	$20200.00	$20402.00	$20606.02	$20812.08	$21020.20
4							
5	Costs						
6	Material	$4000.00	$4000.00	$4000.00	$4000.00	$4000.00	$4000.00
7	Labor	$7000.00	$7000.00	$7000.00	$7000.00	$7000.00	$7000.00
8	Overhead	$4000.00	$4000.00	$4000.00	$4000.00	$4000.00	$4000.00
9							
10	Total Costs	$15000.00	$15000.00	$15000.00	$15000.00	$15000.00	$15000.00
11							
12	Gross Profits	$5000.00	$5200.00	$5402.00	$5606.02	$5812.08	$6020.20
13							
14							

Multiplan displays the values as dollars and cents.

9 Clear the worksheet or quit Multiplan without saving your changes. Choose Transfer Clear All and press N, or choose Quit and press N.

You can also write a macro that changes the default format back to dollars without cents, and then you can run both macros to change quickly from one format to the other.

Running Macros with Multiple Worksheets

Macros are very useful when used with multiple worksheets. You can perform macros that are part of a worksheet in another window. For example, you can put all your macros in a single worksheet, and then load this macro worksheet into a small window in a corner of your screen. When you run a macro, Multiplan performs the macro in the macro worksheet. This saves you time and worksheet space because you do not have to put the same macros in each worksheet.

If you have several worksheets on your screen, Multiplan uses the following conventions:

- If you choose the Goto Macro command and select a cell reference, such as R90C1, Multiplan performs the contents of that cell on the active worksheet. You can have several windows displaying the same worksheet, so you can change the active window without changing the active worksheet.
- If you choose the Goto Macro command and select a cell reference with a window identifier, such as 2:R40C27, Multiplan uses the contents of the selected cell on the worksheet in the designated window.
- If you choose the Goto Macro command and select a macro name, Multiplan searches the active worksheet for the name. If Multiplan does not find the name on the active worksheet, it searches the other worksheets on the screen for the name. Multiplan searches the other currently displayed worksheets in order of their window numbers.

- If you choose the Goto Macro command and select a macro name with a window identifier, such as 2:REFORMAT, Multiplan searches only the designated worksheet for the macro. If Multiplan does not find the name on the designated worksheet, Multiplan displays an error message.
- If you run a macro by pressing Alt and typing a command key sequence, Multiplan searches the active worksheet for the macro that corresponds to the command key sequence. If Multiplan does not find the macro on the active worksheet, it searches the other currently displayed worksheets in order of their window numbers.
- If you build a macro with a 'GO or 'CA command code, and supply a cell reference as the parameter, such as 'CAR1C1, Multiplan performs the contents of the specified cell in the worksheet that the macro is in. For more information on 'GO or 'CA, see "Command Codes" later in this chapter.
- If you build a macro with a 'GO or 'CA command code, and supply a name as the parameter, such as 'CASALES, Multiplan searches the active worksheet for the name. If Multiplan does not find the name on the active worksheet, it searches the worksheet that the macro is in. If Multiplan does not find the name there, it searches all other worksheets in order of their window numbers.

Checking a Macro

Sometimes a macro doesn't work as planned. You may not be able to see all the actions as Multiplan performs them because they happen too quickly. You can press Shift+F5 (single step through macro) to run a macro one step at a time so you can see exactly what it does.

To run a macro one step at a time

1. Press Shift+F5.

   The letters ST replace the word Multiplan in the status line indicating that you are in Single Step mode.
2. Press and hold Alt, and press the macro's command key sequence.
3. Press any key.

   Multiplan performs the macro one step at a time, waiting for you to press another key to run the next step. Multiplan performs the first step in the macro and then pauses. The status line shows the action that the macro just performed.
4. Press Shift+F5 to perform all the remaining steps of the macro.

   ST is no longer displayed in the status line.

You can press Esc at any time to stop running the macro.

Recording a Macro

You can have Multiplan **record** a macro as you perform a procedure. When you record a macro, you see what happens with each keystroke as you type it. Multiplan saves your keystrokes as a macro automatically.

There are four steps in recording a macro:

- Set up the RECORD macro.
- Record the macro information.
- Rename the macro and delete the RECORD name.
- Run the macro.

These four steps are explained in detail in this section.

Setting Up a RECORD Macro

Before you can start recording a macro, you must name a cell or range of cells "RECORD" (you'll give it another name later). Multiplan enters the recorded macro information in the cell or cells that you name as a **RECORD macro**. Multiplan stores up to 64 characters of macro instructions in each cell when recording. If you enter more than this, Multiplan moves down to the next cell in the column. Multiplan uses all the cells in one column of a recording range before starting on the next column.

To set up a RECORD macro

1. Move the cell pointer to a remote area of your worksheet, or select a cell on another worksheet if you want to keep your macros on a separate worksheet.
2. Choose Name.
3. In the "define name" field, type **record**
4. Press Tab to move to the "to refer to" field, and select a range.
5. Press Tab to move to the "macro" field, and press Y to select Yes and identify the named range as a macro.
6. Press Enter.

This sets up the RECORD macro starting at the range you selected in step 4.

Understanding the RECORD Macro

You cannot set up noncontiguous RECORD macros. If you define the RECORD macro to contain several areas that are noncontiguous, that is, that are not next to each other, Multiplan uses only the first cell or group of cells in the list. For example, if you define the RECORD macro to contain the cells R1C1:R10C10 and R50C1:R100C20, Multiplan uses only the first range of cells.

If you define the RECORD macro as a single cell, Multiplan gives the RECORD macro a range extending from that single cell through the end of the worksheet (R4095C255). For example, if you define the RECORD macro as R4000C1, the effective range is R4000C1:R4095C255. If you do not know how many cells you need in a macro, define the RECORD macro as a single cell and let Multiplan use as many cells as it needs. When Multiplan fills the last cell in a column, Multiplan adds the 'GO command code to the cell and continues recording at the top of the next column in the RECORD macro.

Recording a Macro

As you record a macro you can see exactly what the macro will do by watching the part of the worksheet the macro will affect. Otherwise, if you make a mistake while typing, you may not realize it until much later. Multiplan locks the cells in the RECORD macro while you are recording so that you cannot overwrite the information. Multiplan unlocks the cells when you finish recording the macro. You'll press Shift+F9 (record macro) to record a macro.

To record a macro

1. Set up and name the RECORD area as explained in the previous procedure.
2. Move the cell pointer to the area on the main worksheet where you will perform the actions that you want Multiplan to record.
3. Press Shift+F9 to start recording a macro.

   The letters RM replace the word Multiplan on the status line indicating that you are recording a macro.
4. Perform the actions you want Multiplan to record.
5. Press Shift+F9 again to stop recording the macro.

   The letters RM disappear from the status line. Multiplan stops recording your keystrokes.

Now rename the macro and delete the RECORD name.

IMPORTANT Before you do anything else, you should remove the name RECORD so that Multiplan does not record over this macro. If you plan to record more macros later, you may want to set up the RECORD macro for a new range of cells rather than delete it. For more information on naming cells and removing names, see "Name" in Chapter 13, "Commands."

You can record macros by using either the keyboard or the mouse. If you record using the keyboard, Multiplan inserts the keycodes in the macro area, and you can later check and modify them. However, if you record using the mouse, Multiplan uses special mouse codes to record the macro. The mouse codes should not be edited or modified in any way and are not included in the list of keycodes in this chapter. Mouse macros are often specific to the window configuration that is present when you record them. If you find that a previously recorded mouse macro does not work correctly, delete it and record it again. Notice also that macros recorded using the keyboard are generally more compact and take less space than those recorded using the mouse, and they don't depend as much on the window configuration.

Renaming a RECORD Macro

Once you've recorded a macro, rename it and delete the name RECORD so that Multiplan does not record over the macro the next time you record a macro.

To rename a RECORD macro

1. Choose Name.
2. In the "define name" field, type a name for the macro.
3. Press Tab to move to the "to refer to" field, and type **record**

   This is the name of the range containing the macro.
4. Press Tab to move to the "macro" field, and press Y to select Yes and identify the named range as a macro.
5. Press Tab to move to the "command key(s)" field, and type a one-letter or two-letter command key sequence.
6. Press Enter.

Although you have named the macro, Multiplan allows different names for the same or overlapping areas, so the cells are also still named "record." You must delete that name to prevent Multiplan from recording over this macro.

To delete the name RECORD

1. Choose Name.
2. Type **record**
3. Press Tab to move to the "to refer to" field, and press Del to delete the reference.
4. Press Enter.

Running a Recorded Macro

You can run a recorded macro using the associated command key sequence or by choosing the Goto Macro command. See "Running a Macro" earlier in this chapter for more information on running macros.

Example Earlier in this chapter, you used keycodes to create a macro to change the formatting on the SPENCER1.MOD worksheet from whole dollar amounts to dollars and cents. In this example, you'll create a macro to change the formatting by recording the macro as you perform the procedures, rather than by typing in keycodes. You can place the RECORD macro on another worksheet in a separate window.

1 Load the SPENCER1.MOD worksheet and add a border to the window.

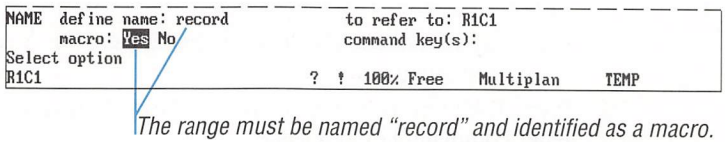
The example files are on the Setup disk; run the SETUP program to copy the files, if you haven't already done so.

2 Move the cell pointer to R13C1 and open a new horizontal window.

3 Clear the new window.

4 Choose Name and enter the following information:

- in the "define name" field, type **record**
- in the "macro" field, press Y to select Yes



The range must be named "record" and identified as a macro.

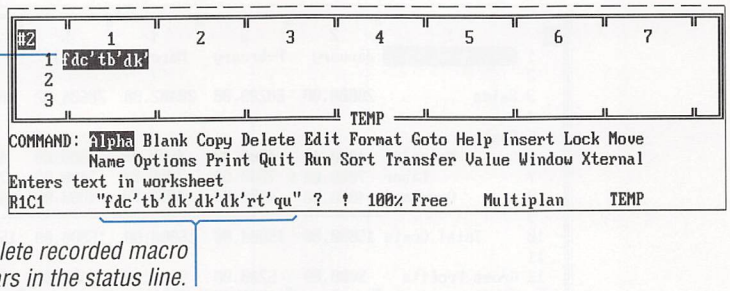
5 Press Enter.

6 Press Shift+F9 and follow these instructions to record the macro:

- choose Format
- choose Default
- choose Cells
- in the "format" field, press a direction key and select the 0.00 format

7 Press Enter.

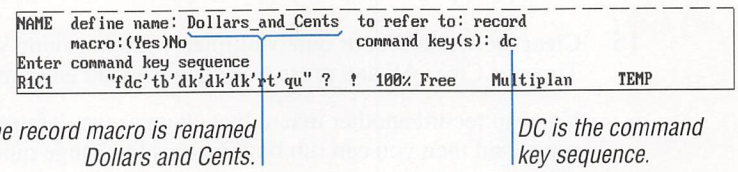
8 Press Shift+F9 to stop recording.



Now rename the new macro.

9 Choose Name and enter the following information:

- in the "define name" field, type **Dollars_and_Cents**
- in the "to refer to" field, type **record**
- in the "macro" field, press Y to select Yes
- in the "command key(s)" field, type **dc**



10 Press Enter.

Now delete the RECORD name.

11 Choose Name and follow these steps:

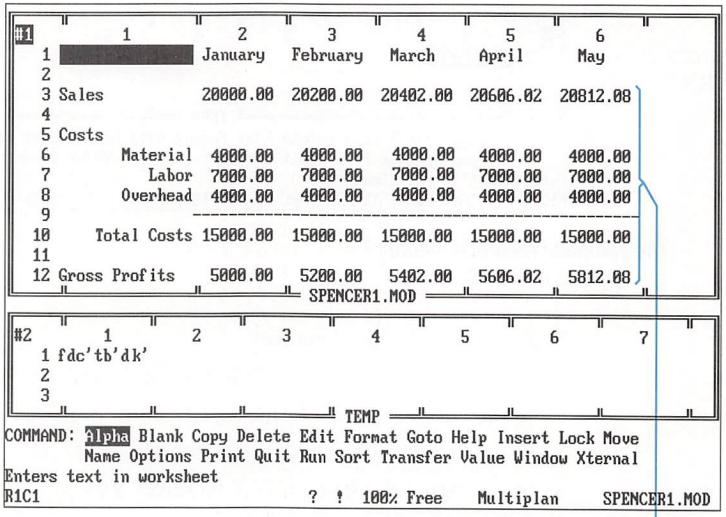
- in the "define name" field, type **record**
- in the "to refer to" field, press Del

12 Press Enter.

13 Press F1 and then press Home to move the cell pointer to the top of the SPENCER1.MOD worksheet.

Now run the macro.

14 Press Alt+DC.



Multiplan reformats the worksheet with the dollars and cents format.

15 Clear the worksheet or quit Multiplan without saving your changes. Choose Transfer Clear All and press N, or choose Quit and press N.

You can record another macro that changes the default format to dollars without cents, and then you can run both macros to change quickly from one format to the other.

Checking the Results

After you have recorded a macro, it is a good idea to check the RECORD area.

To check a recorded macro

1 Move the cell pointer to the area where you recorded the macro.

2 Choose Edit.

3 Examine the keystrokes and keycodes, and edit the cell, or record the macro again.

Identifying RECORD Macro Problems

If you have not set up the RECORD macro before you try to record a macro, Multiplan displays the message, *Use the Name command to define macro RECORD area.*

Because Multiplan cannot automatically set up the RECORD area, you must choose the Name command to select a range for the RECORD macro.

If Multiplan encounters a cell in the RECORD macro that is not blank, it stops recording and displays the message, *Enter Y to overwrite data in cell*, followed by the cell reference.

If you press Y, Multiplan overwrites the contents of the cell and continues recording. If you press N, it stops recording.

If Multiplan fills the final cell of the RECORD macro, it stops recording, sounds a tone, and displays the message, *RECORD range filled, Record Macro stopped.*

You must expand the range of the RECORD macro to add more information. Or you can define the RECORD range as only a single cell, and Multiplan assumes that the entire column is available starting at that single cell.

If Multiplan encounters a cell in the RECORD macro that is locked, it stops recording and displays the message, *Locked cell cannot be changed*, followed by the reference of the locked cell.

Interactive Macros

You can create macros that ask you for information by inserting '? in the macro. Macros and procedures that ask for information are called **interactive**. When Multiplan encounters '? in a macro, it displays CM (for Command Menu) in the status line and waits for you to type something and press Enter. An interactive macro can do the work of several macros, reducing the number of macros you have to keep track of. 'AL, 'QE, and 'VA are also interactive macro codes. For more information, see "Command Codes" later in this chapter.

NOTE Enter is not processed as part of the input; it simply tells Multiplan to continue. If you want to have Enter processed as part of the macro, you have to add the 'RT keycode at the appropriate position after the '? code.

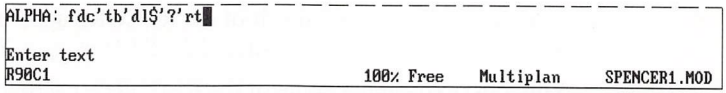
Example You can avoid having to run separate macros by making one interactive macro to reformat the SPENCER1.MOD worksheet. You can have Multiplan choose the appropriate formatting commands, pause, wait for you to select a format from the available list, and then resume running the macro. You can create an interactive macro to change the format on the SPENCER1.MOD worksheet from whole dollar amounts to dollars and cents and back again.

1 Load the SPENCER1.MOD worksheet and move the cell pointer to R90C1.

The example files are on the Setup disk; run the SETUP program to copy the files, if you haven't already done so.

2 Choose Alpha and type the following information:

- **fdc** (for Format Default Cells)
- **'tb** (for Tab)
- **'dl** (for Delete)
- **$**
- **'?** (an interactive macro code)
- **'rt** (for Enter)



3 Press Enter.

4 Choose Name and enter the following information:

- in the "define name" field, type **Dollars_and_Cents**
- in the "macro" field, press Y to select Yes
- in the "command key(s)" field, type **dc**

5 Press Enter.

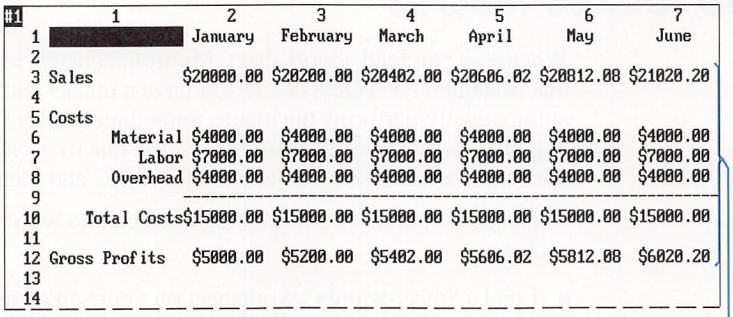
6 Press Home.

7 Press Alt+DC to run the macro.

8 Press a direction key and select the $0.00 format and then press Enter.

$0.00 is a custom format included with the SPENCER1.MOD worksheet.

Multiplan continues with the rest of the macro, and reformats the amounts in the worksheet with the dollars and cents format.



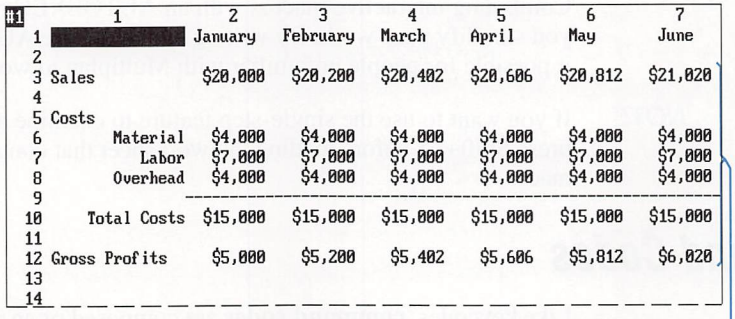
#1	1	2	3	4	5	6	7
1		January	February	March	April	May	June
2							
3	Sales	$20000.00	$20200.00	$20402.00	$20606.02	$20812.08	$21020.20
4							
5	Costs						
6	Material	$4000.00	$4000.00	$4000.00	$4000.00	$4000.00	$4000.00
7	Labor	$7000.00	$7000.00	$7000.00	$7000.00	$7000.00	$7000.00
8	Overhead	$4000.00	$4000.00	$4000.00	$4000.00	$4000.00	$4000.00
9							
10	Total Costs	$15000.00	$15000.00	$15000.00	$15000.00	$15000.00	$15000.00
11							
12	Gross Profits	$5000.00	$5200.00	$5402.00	$5606.02	$5812.08	$6020.20
13							
14							

Multiplan reformats the worksheet with the dollars and cents format.

9 Press Alt+DC to run the macro again.

10 Press a direction key and select the $#,##0;($#,##0) format and then press Enter.

Multiplan reformats the worksheet with whole dollar amounts.



#1	1	2	3	4	5	6	7
1		January	February	March	April	May	June
2							
3	Sales	$20,000	$20,200	$20,402	$20,606	$20,812	$21,020
4							
5	Costs						
6	Material	$4,000	$4,000	$4,000	$4,000	$4,000	$4,000
7	Labor	$7,000	$7,000	$7,000	$7,000	$7,000	$7,000
8	Overhead	$4,000	$4,000	$4,000	$4,000	$4,000	$4,000
9							
10	Total Costs	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000
11							
12	Gross Profits	$5,000	$5,200	$5,402	$5,606	$5,812	$6,020
13							
14							

Multiplan reformats the worksheet with the whole dollars format.

11 Clear the worksheet or quit Multiplan without saving your changes. Choose Transfer Clear All and press N, or choose Quit and press N.

Using AUTOEXEC Macros

Whenever you load a worksheet, Multiplan checks to see if the worksheet has a macro named AUTOEXEC. If you have a macro with this name, Multiplan automatically performs the macro immediately after you load the worksheet. All you need to do to create an AUTOEXEC macro is create a macro and then choose the Name command to name it AUTOEXEC and identify it as a macro.

There are a number of useful things you can do with an AUTOEXEC macro, such as:

- Load a "macros-only" worksheet on your screen as a second worksheet so you can use the macros stored there.
- Display a menu that you have created with the 'MN command code. This menu could include choices like Update Data, Print Report, or Reformat. For more information about 'MN, see the next section, "Command Codes."
- Display a message, such as a reminder to yourself or instructions to someone else who is using the worksheet.
- Run another interactive macro.

Combining interactive macros with an AUTOEXEC macro can do more than help you simplify your work. By writing an interactive AUTOEXEC macro, you make it possible for people unfamiliar with Multiplan to work on your worksheets.

NOTE If you want to use the single-step feature to examine an AUTOEXEC macro, press Shift+F5 before loading the worksheet that contains the AUTOEXEC macro.

Command Codes

Like keycodes, **command codes** are composed of an apostrophe followed by two letters, but they are not standard keyboard functions. You use keycodes in macros to do things such as move the cell pointer, press Tab, and press Enter. You use command codes in macros to do things such as display messages, create your own menus, or make the macro interactive.

The list in this section shows the Multiplan command codes and the information they need. Information you supply with the command code is enclosed in angle brackets (< >). This list does not include keycodes. For more information on keycodes, see "Entering Keycodes" earlier in this chapter.

Command codes can be either uppercase or lowercase characters. When you enter a command code, be sure to include the apostrophes as they are shown in the list. When you enter a command code, do not put a space between the command code and any of the following parts. When you enter a command code, you cannot split it in the middle and put it in separate cells. The entire command code must be in one cell. You can have more than one command code in a cell, but never part of one.

'AL<message>'<cell reference>' 'AL (Alpha) is an interactive command code. You use it to prompt for text (Alpha) input. Use the 'VA command code for entering numeric values.

Multiplan displays the message on the message line, and then waits for keyboard input. You type in the information requested by the message and press Enter. Multiplan puts the information into the cell specified in the cell reference. The message can be no more than 78 characters long.

'CA<cell reference>' You use 'CA (Call) to perform a macro from within another macro. Multiplan continues reading at the specified cell and returns when it encounters 'RE. You cannot have an 'RE without a preceding 'CA. You can use these two command codes to nest up to 16 levels of macros.

'DM 'DM (Disable Menus) disables the menus. When you use this macro code, Multiplan does not update the menus for the remainder of the macro, or until Multiplan encounters an 'EM macro code, or another macro code that requires input, such as 'MC or 'QE. This allows Multiplan to perform complex and visually impressive macros without distracting you by updating the menu. Multiplan ignores this macro code in single-step mode.

'DS 'DS (Disable Screen) disables the screen. When you use this macro code, Multiplan does not update the screen for the remainder of the macro, or until Multiplan encounters an 'ES macro code, or another macro code that requires input, such as 'MC or 'QE. This macro code is similar to the 'DM macro code. Multiplan ignores this macro code in single-step mode.

'EM 'EM (Enable Menus) enables the menus. Use this code to turn menu updating back on during a macro after using the 'DM macro code.

'ES 'ES (Enable Screen) enables the screen. Use this code to turn screen updating back on during a macro after using the 'DS macro code. Multiplan updates the screen whenever it encounters this macro code.

'GO<cell reference>' You use 'GO to redirect the normal running of a macro. Normally, Multiplan reads cells in a macro downward in a column. With 'GO, Multiplan goes to the specified cell and continues running the macro.

'IF<condition>' You use 'IF for performing any operation that may be based on a specified condition. If the condition is true, Multiplan continues reading in the same cell. If the condition is false, Multiplan moves to the next cell down to continue reading.

In the following example, if the value in R1C1 is greater than zero and less than four, Multiplan goes to R100C100 and continues from there. If the value in R1C1 is neither greater than zero nor less than four, Multiplan ignores 'GO, moves down to the next cell, and continues from there.

'IFAND(R1C1>0,R1C1<4)"GOR100C100'

'LA<comment>' You use 'LA to put comments inside the macro. If you create long or complex macros, it is very helpful to add comments. If you want to go back later to change part of the macro, you have built-in reminders of what the macro does. You can add comments two ways:

- Type the text of the comments into cells in the columns next to the macro. As long as you don't use these cells as macros themselves, Multiplan ignores them.
- Use 'LA to put comments inside the macro instead of in the columns next to the macro. Multiplan ignores the comments when you run the macro. This method of adding comments is especially useful if you want to create a macro that uses several columns.

'LE<cell reference>'<value>' You use 'LE to enter the result of <value> in the cell or cells in <cell reference>. The cell reference can be any valid single cell reference, range, or name. The value can be anything you can enter on the command line using the Value command.

'MC<cell reference>' You use 'MC to create your own menus. Menus you create with 'MC appear in place of the command menu and operate the same way as standard Multiplan menus.

'MC in a macro moves Multiplan to the specified cell reference. This reference is the cell in the upper-left corner of a range that must be three rows high by two to twelve columns wide.

You put labels in the first row of the range. These labels appear as menu items in the first line of the menu.

You put longer menu descriptions in the second row. The appropriate menu description appears on the message line when the corresponding menu item in the first line is highlighted. You choose menu items in the normal way. If there are two or more commands with the same first letter, Multiplan chooses the first one it encounters.

When you choose a menu item, Multiplan moves to the cell in the third row below the long menu description, then continues reading.

If you want a menu choice to run a macro, start writing the macro in the cell below the long menu description. Then, when you choose that menu item, Multiplan automatically runs the correct macro.

If you press Esc at a menu created by 'MC, Multiplan cancels the menu and returns to the point in the macro just after the 'MC and continues from there. So to stop a macro during 'MC, you must press Esc twice: once to cancel the menu and return to the macro, and a second time to cancel the macro. If 'MC commands are nested several levels deep, you may have to press Esc more than twice. See the ACCREC.MOD file on the Setup disk for an example of custom menus.

'MN<cell reference>' 'MN works the same way as 'MC in every way but one: Multiplan does not automatically return to the macro containing 'MN. If you need to continue reading after 'MN, you either put 'GO in the appropriate place of the macro that was run when you chose a menu item, or use 'MC instead of the 'MN command. See the preceding explanation of 'MC for more information.

'QE<prompt>' You use 'QE the same way as you use '?, except that 'QE allows you to specify a prompt. When Multiplan performs this command code, it displays the prompt and waits for you to enter information.

'QU You use 'QU (Quit) to end a macro. When Multiplan encounters 'QU, it stops running the macro and returns to the command menu.

You can end a macro either with a blank cell or with 'QU. However, it is usually best to use 'QU to be certain that the macro ends where you want it to.

'RE You use 'RE (Return) to end a macro you started with 'CA and return to the macro containing 'CA. When Multiplan encounters 'RE in a macro, it returns to just after the last 'CA and continues to run that macro. You cannot use 'RE without a preceding 'CA.

'RR<cell reference>' You use 'RR to perform a selective recalculation on the cell reference specified. Multiplan recalculates the specified area of the worksheet.

'VA<message>'<cell reference>' 'VA is an interactive command code. You use it to prompt the user to enter a value. Multiplan displays the message on the third line of the menu, then waits for keyboard input. You type a numeric value and press Enter. Multiplan puts the value into the cell specified in the cell reference. If the expression does not produce a numeric value, Multiplan displays an error message. As with the 'AL command code, the message cannot be more than 78 characters long.

'? You use '? to make a macro interactive. When Multiplan encounters a '? in a macro, it displays CM (for Command Menu) in the status line and waits for you to enter information.

Putting It All Together

This section gives you practice using macros with the 6MTOTAL.MOD worksheet. In the following section, you will keep a six-month moving total of the sales for three products. You want to create a macro that automates each month's updating and data entry.

The task of updating consists of two parts: making room for the newest month's sales information, and entering that information. It will be easier to create a macro for this task if you also write it in two parts: one part to make the room, and the other to enter the figures.

Making Room on the Worksheet

Create the part of the macro that makes room for the new figures.

To make room on the worksheet

1. Load the 6MTOTAL.MOD worksheet.

   The example files are located on the Setup disk; run the SETUP program to copy the files if you haven't already done so.

2. Move the cell pointer to R30C1.

   You must first make room for the newest month's figures by copying the five most recent months one column to the left.

3. Choose Alpha.

   You always enter a macro as text.

4. Type **c** (for Copy).

5. Type **f** (for From).

6. Type **r3c3:r9c7**

   This is the range you want to copy.

7. Type **'tb**

   This will tab to the "to" field.

8. Type **r3c2**

   This is the cell where you want to start copying the range.

9. Type **'rt** to carry out the Copy From command.

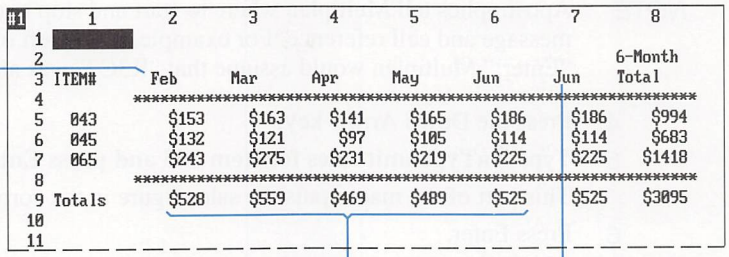
```
ALPHA: cfr3c3:r9c7'tbr3c2'rt

Enter text
R30C1                              ?  !  100% Free     Multiplan     6MTOTAL.MOD
```

10. Press Enter.

If you want to run this Macro with the Goto Macro command now, then save the worksheet under a new name and load it again immediately after you run the Macro. This will keep you from permanently changing the worksheet. Here is what the example worksheet would look like if you ran the macro as it is now:

February's figures are copied over the old January figures.



#1	1	2	3	4	5	6	7	8
1								
2								6-Month
3	ITEM#	Feb	Mar	Apr	May	Jun	Jun	Total
4		**********	**********	**********	**********	**********	**********	**********
5	043	$153	$163	$141	$165	$186	$186	$994
6	045	$132	$121	$97	$105	$114	$114	$683
7	065	$243	$275	$231	$219	$225	$225	$1418
8		**********	**********	**********	**********	**********	**********	**********
9	Totals	$528	$559	$469	$489	$525	$525	$3095
10								
11								

These columns move one column to the left.

July's figures can be entered over the duplicate June figures.

Multiplan copies the five most recent months, February through June, to the left. You did not need to erase the oldest month in the macro because it disappears when you copy over it. The month in column 7, June, is not removed because you can enter the new month, July, right over it.

Entering the Information

If you were keeping a twelve-month total instead of six, you might find it difficult to enter the correct figures because the list of product numbers is not on the screen. Or perhaps you have to keep track of hundreds of products, or you want someone else to enter the data.

Therefore, the second task is to make it easier for you and others to enter data in your macro. Do this by adding command codes to make your macro interact with the user. When you use command codes, remember not to split them in the middle. You must put the entire command code in the cell in which you begin it.

To make the macro interactive

1. Move the cell pointer to R31C1.

   You set up the second part of the macro in the cell below the one you just created.

2. Choose Alpha.

3 Type **'alType month and press Enter:'r3c7'**

The 'AL command code displays the message "Type month and press Enter:" and waits for you to type an entry and press Enter. Then the 'AL command code puts your input in R3C7.

NOTE Apostrophes tell Multiplan where to start and stop reading the text for the message and cell reference. For example, if you left off the apostrophe after "Enter:" Multiplan would assume that "R3C7" was also part of the message.

4 Press the Down Arrow key.

5 Type **'vaType unit sales for item 043 and press Enter:'r5c7'**

This part of the macro puts the sales figure in the correct cell.

6 Press Enter.

You can save yourself a lot of time by copying cell R32C1 to R33C1 and then editing the information.

To copy and edit the cell

1 Choose Copy.

2 Choose Down.

3 In the "number of cells" field, type **1**

4 Press Enter.

5 Press the Down Arrow key.

6 Choose Edit.

7 Press F9 (character left) until the 3 in "043" is highlighted.

8 Press Del to delete the highlighted character.

9 Type **5**

10 Press F10 (character right) until the 5 in "R5C7" is highlighted.

11 Press Del to delete the highlighted character.

12 Type **6**

```
EDIT: "'vaType unit sales for item 045 and press Enter:'r6c7'"

Enter formula
R33C1     "'vaType unit sales fo" ?  !  100% Free    Multiplan     6MTOTAL.MOD
```

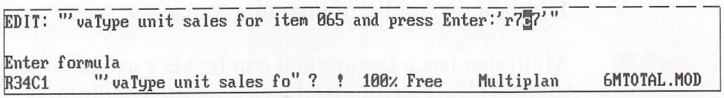
13 Press Enter.

Now copy R33C1 to R34C1 and edit it as you did before.

To copy and edit the cell again

1. Choose Copy.
2. Choose Down.

   The proposed response in the "number of cells" field is 1.
3. Press Enter.
4. Press the Down Arrow key.
5. Choose Edit.
6. Press F9 until the 4 in "045" is highlighted.
7. Press Del to delete the highlighted character.
8. Type **6**
9. Press F10 until the 6 in "R6C7" is highlighted.
10. Press Del to delete the highlighted character.
11. Type **7**



12. Press Enter.

Now set up the next cell with 'QU to let Multiplan know that this is the end of the macro.

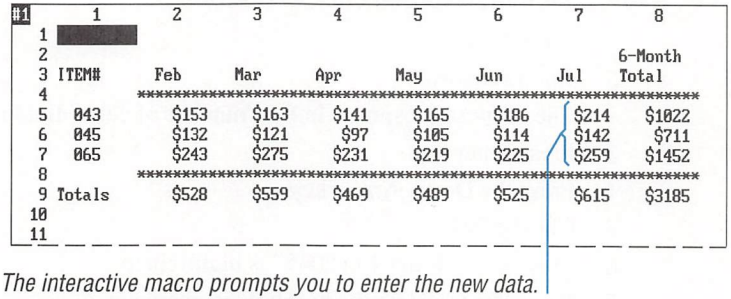
To enter the 'QU command code

1. Move the cell pointer to R35C1.
2. Choose Alpha.
3. Type **'qu**

   This command code tells Multiplan to quit running the macro.
4. Press Enter.

This completes the process of entering the macro instructions.

This macro now automates the chore of monthly updates. Next, you should name the macro. Then run the macro by choosing the Goto Macro command, and enter some sample amounts. The next illustration shows what the worksheet might look like after running the macro.



#1	1	2	3	4	5	6	7	8
1								
2								6-Month
3	ITEM#	Feb	Mar	Apr	May	Jun	Jul	Total
4		**********	**********	**********	**********	**********	**********	**********
5	043	$153	$163	$141	$165	$186	$214	$1022
6	045	$132	$121	$97	$105	$114	$142	$711
7	065	$243	$275	$231	$219	$225	$259	$1452
8		**********	**********	**********	**********	**********	**********	**********
9	Totals	$528	$559	$469	$489	$525	$615	$3185
10								
11								

The interactive macro prompts you to enter the new data.

Macros are extremely powerful. You can use them for anything from automating simple tasks such as reformatting to extremely complex operations. For example, you could edit the update macro in this section to look at the current date, and, if it is after the first of the month, ask you if you want to update the worksheet and then start the update procedure.

For more examples of how to use macros, see the example files on the Setup disk.

NOTE Multiplan has a feature that can be very useful when you're creating a macro that performs a command based on the condition of another cell: you can enter formulas in command fields. For example, if R1C1 contained the integer 4, you (or the macro) could type **r1c1** in the "number of cells" field of the Copy Down command. Multiplan would then copy the selected cells down four rows.

10 Auditing a Worksheet

Auditing is the process of verifying or tracking down errors in formulas, cell references, and named ranges. Auditing is particularly useful for checking large worksheets, worksheets with many names, worksheets developed by others, or sensitive calculations that require precise results and where errors can be costly (such as bids).

It is always a good idea to check your worksheets for possible problems. Although you can do this manually, it is much easier to let Multiplan do the work for you.

This chapter explains how to:

- Audit and examine formulas.
- Audit and examine cell references.
- List and document cells that refer to other cells.
- List and document names on a worksheet.
- List and document unusual conditions on a worksheet.

Auditing a Formula

Auditing a formula is the process of examining the cells referred to by a formula. You audit a formula:

- To verify that a result is being calculated correctly.
- To identify the cause of an error value or message.

You audit formulas by choosing the Run Audit Formulas command. This command determines what cells calculate a given result. You cannot use the Run Audit Formulas command to audit a cell that does not contain a formula.

To audit a formula

1. Move the cell pointer to the cell containing the formula you want to audit.
2. Choose Run.
3. Choose Audit.
4. Choose Formulas.
5. Press Enter.

   The upper window displays information about the cell you are auditing. The lower window displays information about the cell reference or name that is highlighted in the upper window.

You can audit further by pressing the Down Arrow key. This moves the information in the lower window to the upper window, and the lower window displays information about the next formula. If you continue pressing the Down Arrow key until you reach a cell without a formula (or if you try to audit a cell that does not contain a formula), Multiplan displays the message, *Can only audit cells with formulas*.

Pressing the Up Arrow key returns you to a previous formula. The information in the upper window moves to the lower window, and the cell information associated with the previous formula appears in the upper window.

You press the Right Arrow and Left Arrow keys to select cell references in the formula in the upper window. If there is no formula in the cell in the upper window, the lower window is left blank.

After you choose the Run Audit Formulas command, Multiplan displays the "cell" field just below the lower window. This field shows the path you are auditing. Each time you press a direction key, Multiplan updates the path in the "cell" field.

To stop auditing a formula and return to the main menu, press Esc.

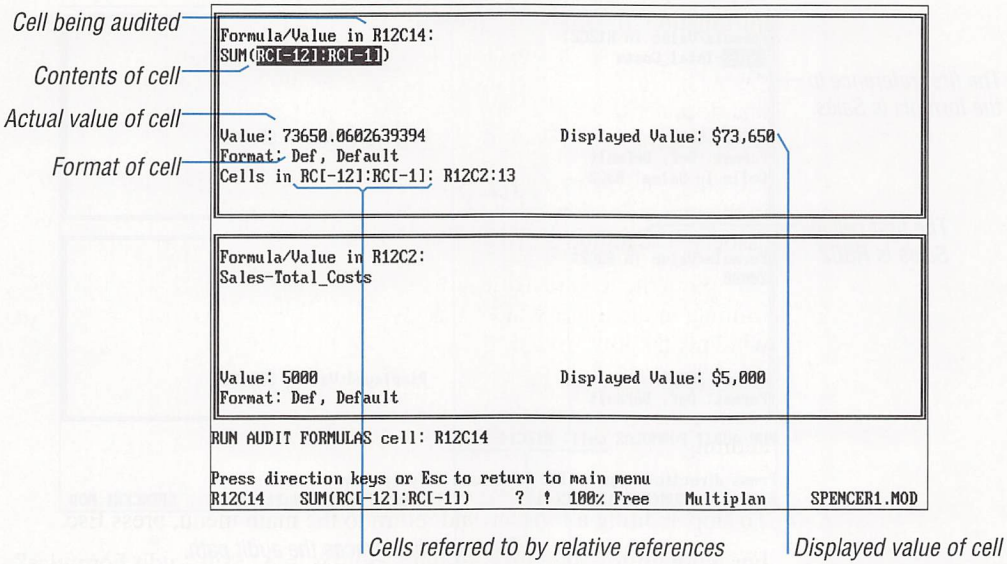
For more information on auditing formulas, see "Run Audit Formulas" in Chapter 13, "Commands."

Example You can check the values on the SPENCER1.MOD worksheet that go into the total of Gross Profits.

1. Load the SPENCER1.MOD worksheet and move the cell pointer to R12C14.

   The example files are located on the Setup disk; run the SETUP program to copy the files, if you haven't already done so.

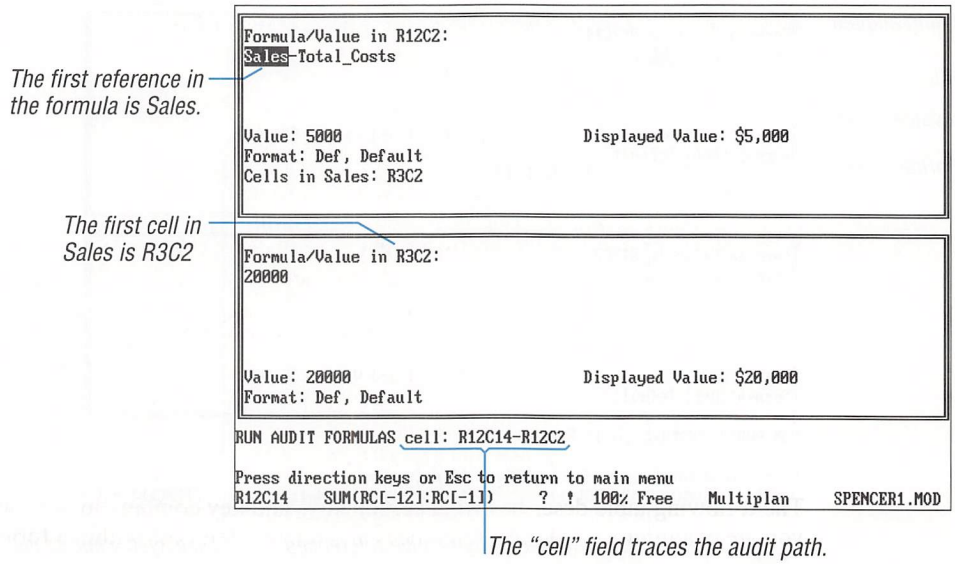
2. Choose Run.
3. Choose Audit.
4. Choose Formulas.
5. Press Enter.



6 Compare the "Value" and "Displayed Value" fields to check the numerical precision of the values in your worksheet.

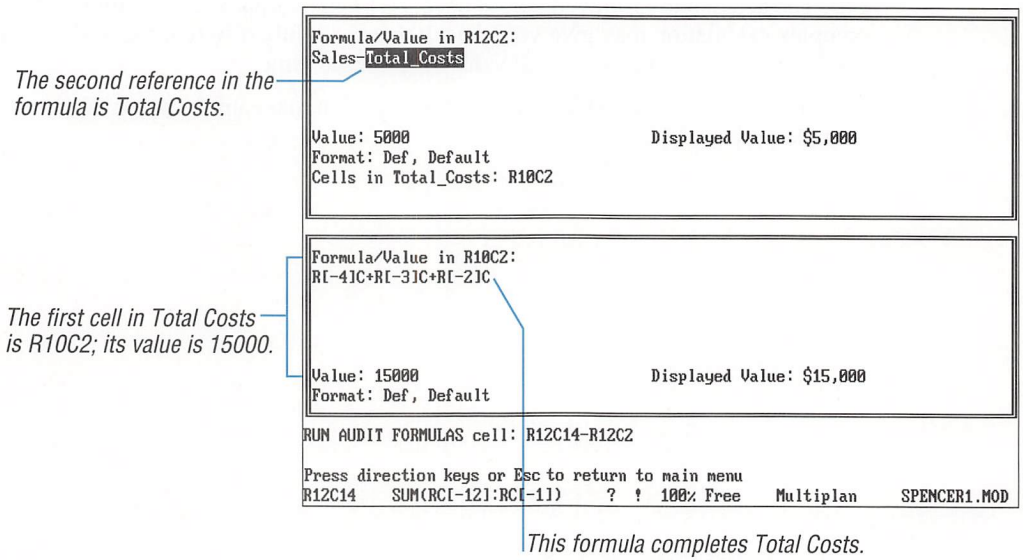
The actual value is what Multiplan stores in its memory; the displayed value is what Multiplan displays in the cell and is based on the format defined for that cell. The actual and displayed values of R12C14 are similar in this example. A complex calculation may give you a result that is slightly different from what you expect if the actual and displayed values are not the same.

7 Press the Down Arrow key to examine the cells that make up the range of the formula in R12C14.



You can also press the Right Arrow and Left Arrow keys to display the cells that make up a range or name.

8 Press the Right Arrow key to display information about Total Costs.



9 Press Esc to return to the main menu.

10 Clear the worksheet or quit Multiplan. Choose Transfer Clear All or choose Quit.

Auditing Ranges and Named Areas

Formulas often include names and ranges. For example, a cell may contain the formula =SUM(WAGES,BONUSES) where WAGES and BONUSES are named ranges. When you are auditing a formula and examining a range of cells within the formula, the standard order for displaying cells in that range is to show all the columns in a row, and then continue with the next row. For example, if you are examining the range R1C1:R3C3, pressing the Right Arrow key repeatedly at the start of the range shows you R1C1, then R1C2, then R1C3, then R2C1, then R2C2, and so on. If you press the Right Arrow key after reaching the end of a named range, Multiplan shows you the first cell in the next range, if there is one.

Selecting Cells While Auditing a Formula

The following table describes what certain keys and key combinations do when you are examining single cell references and range references within a formula.

Key	Single reference	Range reference
Left Arrow	Goes to previous reference	Goes to previous reference in range
Right Arrow	Goes to next reference	Goes to next reference in range
Ctrl+Left Arrow	Goes to previous reference	Goes to reference immediately before range
Ctrl+Right Arrow	Goes to next reference	Goes to reference immediately after range
PgUp	Sounds a tone	Goes to previous row in range, or sounds a tone if none
PgDn	Sounds a tone	Goes to next row in range, or sounds a tone if none
Home	Does not move	Goes to first cell in range
End	Does not move	Goes to last cell in range



The following table lists mouse actions and how they work when using the Run Audit Formulas and Run Audit Cells commands.

Mouse action	Result
Click name, reference, or cell	Selects name, reference, or cell
Click right button on range	Selects next item in range
Click left button on range	Selects previous item in range
Click both buttons	Returns to menu

There is no mouse action to reproduce the action of PgUp or PgDn.

Auditing Circular References

A **circular reference** occurs when two or more cells depend on each other for values. For example, if you set R1C1 equal to R2C1, R2C1 equal to R3C1, and then R3C1 equal to R1C1, then you have a circular reference. (The first cell depends on the second; the second depends on the third; and the third depends on the first). Multiplan is faced with an impossibility: it cannot calculate R1C1 until it knows the value of R1C1. When you create a circular reference, Multiplan sounds a tone and displays the error message, *Cannot resolve circular references.*

Multiplan also sounds a tone and displays an error message if you audit a path that ends in a circular reference. If this happens, make a note of the cells involved. You must change the formulas so that Multiplan can calculate the value of one cell before the other.

NOTE Multiplan displays the same error message if you are auditing formulas that use iteration. However, if you are using formulas that use iteration, you may not need to correct the circular references. For more information, see Chapter 12, "Iteration."

Auditing a Cell

Auditing cells is the process of examining the cells referring to a cell. You audit cells by choosing the Run Audit Cells command. Use this command to determine in what formula a cell is used.

To audit a cell

1. Move the cell pointer to a cell used by other cells or formulas—the cell you want to audit.
2. Choose Run.
3. Choose Audit.
4. Choose Cells.

   Multiplan proposes the active cell. You can specify any valid single cell reference in the "cell" field, but you cannot select a range.
5. Press Enter.

The upper window displays information about the cell you are auditing. A list of all the cells that refer to this cell appears starting on the second line of the upper window. If there are more cell references than can be displayed at one time in the upper window, you can press PgUp and PgDn to view the rest of the list of cells.

There may be several cells listed in the upper window, but only one is highlighted. Press the Left Arrow and Right Arrow keys to highlight a particular cell. The lower window displays information about the cell highlighted in the upper window. If the cell displayed in the upper window is not referred to by any other cells, the lower window remains blank..

You can continue auditing by pressing the Up Arrow key. This moves the information in the lower window to the upper window. You can examine the cells that refer to this cell as you did with the previous cell. You can return to a previous cell by pressing the Down Arrow key.

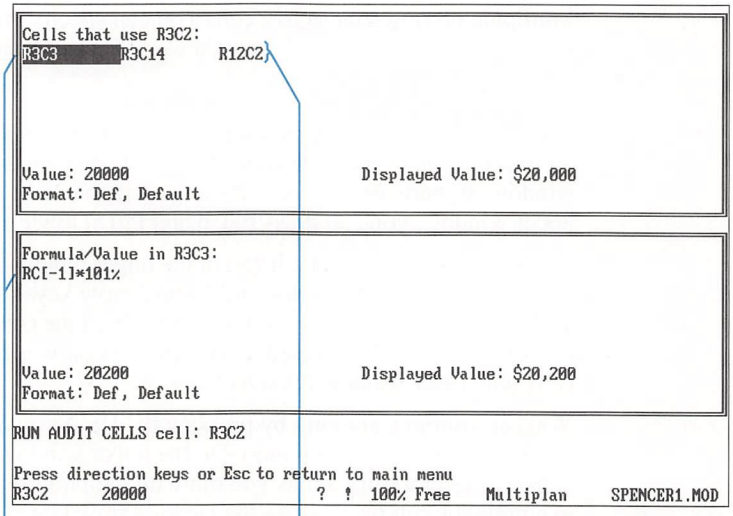
To stop auditing cells and return to the main command menu, press Esc.

For more information on auditing cells, see "Run Audit Cells" in Chapter 13, "Commands."

Example On the SPENCER1.MOD worksheet, you can audit the cells in the Sales row to see how they contribute to the other cells in the same row, to the Sum column, and to Gross Profits.

1. Load the SPENCER1.MOD worksheet and move the cell pointer to R3C2.

   The example files are on the Setup disk; run the SETUP program to copy the files, if you haven't already done so.
2. Choose Run.
3. Choose Audit.
4. Choose Cells.
5. Press Enter.



The second window shows the formula in R3C3.

These three cells contain formulas that use cell R3C2.

6. Press Esc to return to the main menu.
7. Clear the worksheet or quit Multiplan. Choose Transfer Clear All or choose Quit.

Cross-Referencing Cells

A **cross-reference report** shows a list of all the cells that refer to another cell. It differs from auditing cells by showing how cells refer to each other on your entire worksheet. Only cells that contain formulas are included in this report.

To print a cross-reference report, you must set the "print width" field in the Print Margins command to 70 characters, and you must have a printer that can print 80 columns.

To print a cross-reference report

1. Choose Run.
2. Choose Report.
3. Choose Print.
4. Choose Cross-ref.
5. In the "cell" field, type the cell reference for the cells you want to examine.

   If you do not select a reference, Multiplan reports on the entire worksheet.
6. Press Tab to move to the "references" field, and press Y to select Yes if, for every cell containing a formula, you want Multiplan to print a list of the cells used in that formula.
7. Press Tab to move to the "value" field, and press Y to select Yes if you want Multiplan to print the values contained in the cells.
8. Press Tab to move to the "format" field, and press Y to select Yes if you want Multiplan to print the format of the cells.
9. Press Tab to move to the "levels" field, and enter the number of indented levels that you want Multiplan to include in the report.
10. Press Tab to move to the "indent" field, and enter the number of inches, centimeters, or characters that you want Multiplan to indent at each level.
11. Press Enter.

NOTE You can print the report to a file instead of to a printer by choosing Run Report File Cross-ref instead of Run Report Print Cross-ref. Then, set the "file" field to the name of the file where you want to save the information. All other steps are identical to those in the preceding procedure. Once you print a report to a file, you can edit it with a word processor and print it, but you cannot copy the information back into Multiplan.

The currently defined report header and footer print on each page of the report the same way they do when you print a worksheet. For more information on headers and footers, see Chapter 3, "Printing a Worksheet."

For a complete explanation of the fields you set in the preceding procedure, and for more information on cross-reference reports, see "Run Report File Cross-Ref" and "Run Report Print Cross-Ref" in Chapter 13, "Commands."

Example You can print a cross-reference report for the entire SPENCER1.MOD worksheet, including references, values, and formats.

1. Load the SPENCER1.MOD worksheet.

   The example files are on the Setup disk; run the SETUP program to copy the files, if you haven't already done so.

2. Choose Run.
3. Choose Report.
4. Choose Print.
5. Choose Cross-ref and enter the following information:
   - in the "levels" field, type **3**
   - in the "indent" field, type **1cm**

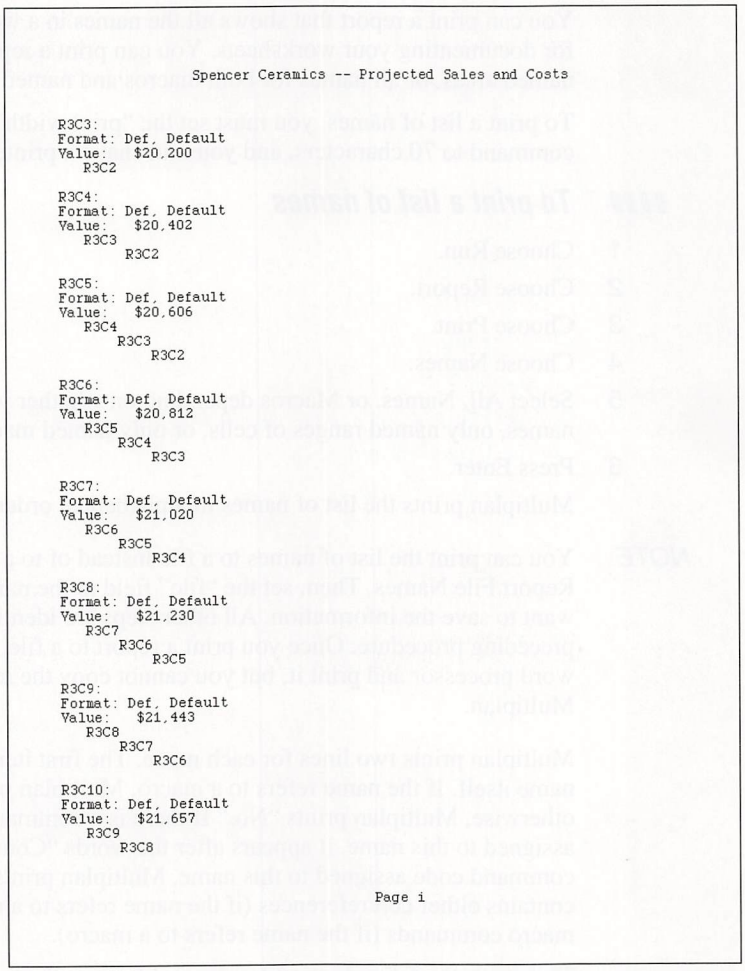
```
RUN REPORT PRINT CROSS-REF cell: R1:4095    references:(Yes)No
           value:(Yes)No   format:(Yes)No   levels: 3  indent: 1cm
Enter measurement
R12C2     Sales-Total_Costs        ? !  100% Free    Multiplan     SPENCER1.MOD
```

Enter 3 to display three levels of indentation.

Enter 1cm to indent each level by that amount.

6. Press Enter.

The first page of the report looks like this:



```
                    Spencer Ceramics -- Projected Sales and Costs

R3C3:
Format: Def, Default
Value:   $20,200
   R3C2

R3C4:
Format: Def, Default
Value:   $20,402
   R3C3
        R3C2

R3C5:
Format: Def, Default
Value:   $20,606
   R3C4
        R3C3
             R3C2

R3C6:
Format: Def, Default
Value:   $20,812
   R3C5
        R3C4
             R3C3

R3C7:
Format: Def, Default
Value:   $21,020
   R3C6
        R3C5
             R3C4

R3C8:
Format: Def, Default
Value:   $21,230
   R3C7
        R3C6
             R3C5

R3C9:
Format: Def, Default
Value:   $21,443
   R3C8
        R3C7
             R3C6

R3C10:
Format: Def, Default
Value:   $21,657
   R3C9
        R3C8

                                                    Page i
```

7 Clear the worksheet, or quit Multiplan. Choose Transfer Clear All, or choose Quit.

Listing Names

You can print a report that shows all the names in a worksheet. This is very useful for documenting your worksheets. You can print a report of all macro names, all named areas, or all names for both macros and named areas.

To print a list of names, you must set the "print width" field in the Print Margins command to 70 characters, and you must have a printer that can print 80 columns.

To print a list of names

1. Choose Run.
2. Choose Report.
3. Choose Print.
4. Choose Names.
5. Select All, Names, or Macros depending on whether you want to print all names, only named ranges of cells, or only named macros.
6. Press Enter.

   Multiplan prints the list of names in alphabetical order.

NOTE You can print the list of names to a file instead of to a printer by choosing Run Report File Names. Then, set the "file" field to the name of the file where you want to save the information. All other steps are identical to those in the preceding procedure. Once you print a report to a file, you can edit it with a word processor and print it, but you cannot copy the information back into Multiplan.

Multiplan prints two lines for each name. The first item on the first line is the name itself. If the name refers to a macro, Multiplan prints "Yes" after "Macro"; otherwise, Multiplan prints "No." If there is a command key sequence code assigned to this name, it appears after the words "Command Code." If there is no command code assigned to this name, Multiplan prints "none." The second line contains either cell references (if the name refers to a named area) or a set of macro commands (if the name refers to a macro).

The currently defined report header and footer print on each page of the report the same way they do when you print a worksheet. For more information on headers and footers, see Chapter 3, "Printing a Worksheet."

For more information on listing names, see "Run Report File Names" and "Run Report Print Names" in Chapter 13, "Commands."

Listing Worksheet Statistics

One of the best ways to avoid errors in a worksheet is to eliminate the conditions that are most likely to cause them, such as cells with undefined values, formulas that refer to blank cells, and named areas that overlap.

You can print a summary report of unusual conditions such as these that may cause problems.

To print a summary report, you must set the "width" field in the Print Margins command to at least 70 characters, and you must have a printer that can print 80 columns.

NOTE Multiplan must do a lot of calculation to create a summary report. On a large worksheet, this may take some time. Consider whether you want to wait for results before you create a summary report for a large worksheet. Under OS/2, Multiplan can create the report in the background, allowing you to use your computer for other tasks while you wait.

To print a summary report

1. Choose Run.
2. Choose Report.
3. Choose Print.
4. Choose Summary.
5. Select Counts for a simple count of the error conditions or select Full for a full count of each kind of unusual condition and the associated cells.
6. Press Enter.

NOTE You can print the summary report to a file instead of to a printer by choosing Run Report File Summary. Then, set the "file" field to the name of the file where you want to save the information. All other steps are identical to those in the preceding procedure. Once you print a report to a file, you can edit it with a word processor and print it to a printer, but you cannot copy the information back into Multiplan.

Remember that this report only identifies the unusual conditions that are most likely to lead to errors. You must determine for yourself if these conditions are problems in your worksheet.

The currently defined report header and footer print on each page of the report the same way they do when you print a worksheet. For more information on headers and footers, see Chapter 3, "Printing a Worksheet."

For more information on printing summary reports, see "Run Report File Summary" and "Run Report Print Summary" in Chapter 13, "Commands."

11 Database

A **database** is a tool for organizing, managing, and retrieving information. You create a database on a worksheet and use it to store and manipulate large, complex bodies of data.

With a database you can extract subsets of data based on criteria you specify and perform statistical calculations on data for analysis and decision making. You can sort data alphabetically, numerically, in ascending or descending order, by names or locations, or by other categories you specify. You can also print selected items or groups of items in your database.

For example, you might create a database from a list of clients, their addresses, and their sales transactions. You could then use the database to find all transactions during a certain period for one client or to prepare a printed report summarizing those transactions.

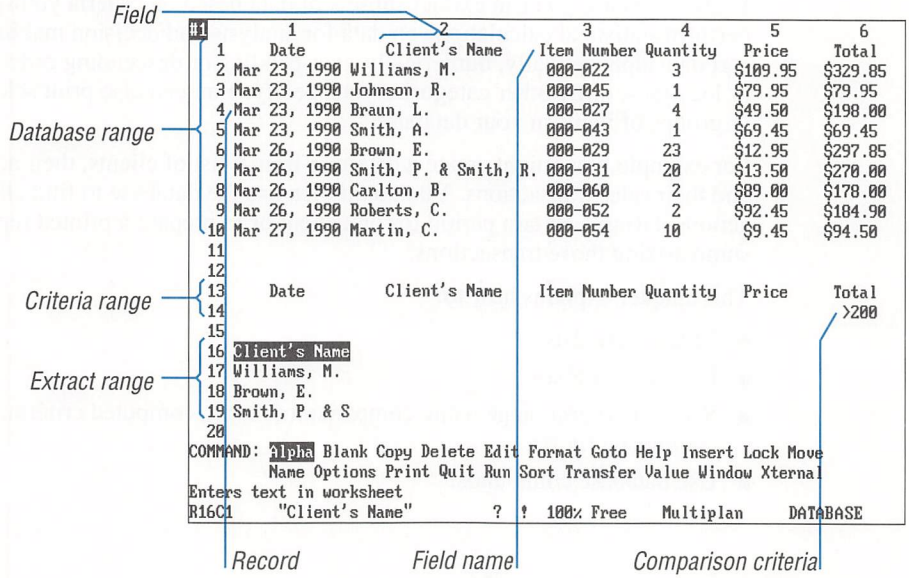
This chapter explains how to:

- Create a database.
- Format a database.
- Set up a criteria range using comparison criteria, computed criteria, or combined criteria.
- Use database commands.

Understanding Databases

Before you can create your own databases, you need to become familiar with some of the terms and concepts associated with databases.

The following illustration shows a sample Multiplan database.



Database range A rectangular area of the worksheet that you use as a database. You use the Name command to name the database range on a worksheet. The entire range must be specifically named "database." In the preceding illustration, the range R1C1:R10C6 is the database range.

Field An individual category of information in a database. Each column in a database is a separate field, and each of the cells within a column is a field. In the illustration, the listings under "Client's Name" comprise a field, as do the listings under "Date" and "Item Number" and so on. You can enter text, numbers, dates, formulas, and functions as field entries.

Field name A name that identifies a field. In the illustration, "Item Number" and "Quantity" are examples of field names. Field names identify the fields of data. They must appear at the top of the database range.

Record A collection of related fields. Each row in a database is a separate record. Each record contains the same fields as every other record in the database. In the illustration, all the information associated with "Braun, L." in row 4 is a record. All the records and the field names collectively form the database.

Criteria range A rectangular area of the worksheet that contains the criteria for finding, extracting, and deleting information. You use the Name command to define the criteria range. The entire range must be specifically named "criteria," and must be on the same worksheet as the database range. In the illustration, the range R13C1:R14C6 is the criteria range.

Comparison criterion One of two basic types of criteria that tell Multiplan which records in the database to find, extract, or delete. The column heading for a comparison criterion must be a valid database field name. Multiplan tests database records by comparing the value of this field against what you specify as the comparison criterion. In the illustration, ">200" is a comparison criterion.

Computed criterion (Not shown.) One of two basic types of criteria that tell Multiplan which records in a database to find, extract, or delete. The column heading for a computed criterion must not be a valid database field name. Multiplan tests the database records against the result of a formula that refers to one or more fields in a record.

Extract range A separate area of the worksheet set aside for data retrieved and copied from the database. When Multiplan extracts data, it finds records based on the criteria you specify and copies them to the extract range. In the illustration, the data in rows 17 through 19 are the records that meet the criteria specified in the criteria range.

Creating a Database

The steps for creating a database are:

- Planning the database
- Entering information
- Formatting the database
- Setting up the database range—the area where you entered the field names and records

Planning Your Database

Before you create your database, consider how you will use it. With careful planning, you can create a database that allows fast data retrieval and makes efficient use of the worksheet space.

Follow these guidelines for organizing a database:

Create the records from the events or items you want to track Consider the kind of data you want to manage with the database. For example, if you have to track sales orders, make each sales order transaction a record in the database.

Create the fields from the categories of data you need to keep for each event or item For example, to track sales orders you might need to know the date; the client's name, address, and phone number; the quantity and price of each item ordered; and the order total. These would all become fields in the database.

Use a separate field for each item you may want to retrieve separately and make each field name unique For example, if you want to sort addresses by ZIP Code, create one field for addresses and a separate field for ZIP Codes, rather than a single field containing both addresses and ZIP Codes.

Test the design of your database If you need to create a large database with many records, test the database with only 10 records. Try a few data retrieval techniques to see if the database organization suits your purposes. For information on data retrieval techniques, see "Setting Up a Criteria Range," "Using Database Commands," and "Using Database Functions," later in this chapter.

Entering Information

You enter information in a database the same way you enter information in any part of a worksheet. Use the Alpha and Value commands to enter text and numbers. You can use uppercase or lowercase letters (Multiplan ignores capitalization when searching or sorting).

You enter the field names in the first row of the database. The first row of a database is always used for field names. Field names must be either text, formulas that produce text, or references to cells containing text.

Enter records in the rows below your field names. The cells in a record are no different from cells in a worksheet row. They can contain any value or formula that you would enter into a worksheet cell. You can enter values or formulas under the same field name.

Every record in the database must have the same fields, but you do not have to enter data in each field. Be careful not to insert extra spaces at the beginning or end of entries in a field, as extra spaces can affect the results of a search.

Your database can include formulas that calculate values. For example, you might have a "Total" field that multiplies quantity ordered and price in every record. You can also perform calculations as part of your criteria when you search for, extract, and delete records. For more information, see "Entering Computed Criteria," later in this chapter.

You can edit a database using any of the editing techniques for worksheets such as adding or deleting fields and records, or copying data. If you insert, delete, sort, move, or copy records in the middle of the database, Multiplan automatically adjusts the database range. If you add a new record to the end of the database, you need to redefine the database range.

If you move a record outside the database range, Multiplan assumes you have deleted the record. Similarly, if you move a record into the database range, Multiplan assumes you are inserting a new record.

Formatting a Database

Because you keep your database on a worksheet, you don't have to learn any special rules for formatting data. For example, you can format a database with any of the worksheet formatting options such as alignment or column width adjustments, font choices, and predefined or custom formats.

Here are a few hints about formatting a database:

- Because all entries in a particular field are similar, it is usually best to use the same formats for an entire field. Use the Copy Down command to copy formats quickly.
- Exclude the field names when formatting a field, because the same formats generally do not apply. For example, field names are always text but the actual data they describe may be numbers, or text in special formats.
- Many of the display formats and options you use to view normal worksheet ranges—such as opening multiple windows or splitting a window—are also very useful for working with large databases.
- If you have formatted the information in a field, you can only search for the unformatted values of its cells. For example, if you are searching for an amount, search for 1234.56 rather than $1,234.56.

Setting Up a Database Range

You can use any range of cells with as many columns and rows as you need to hold your database. A database includes all field names and records..

To define a database range

1. Enter the field names in the first row of the area that will become the database range.
2. Enter the records in the rows below the field names.
3. Move the cell pointer to the upper-left corner of the database range.
4. Type **:** to select a range.
5. Move the cell pointer to the opposite corner of the database range.
6. Choose Name.
7. In the "define name" field, type **database**
8. Press Enter.

Multiplan creates the database range. Multiplan looks for the name "database" to determine which area of the worksheet to search for data. You can include new records anywhere within the database without having to redefine the database range. If you add a new record to the end of the database, however, you need to redefine the database range.

You can keep many databases on one worksheet and then define each one as you need it, but you can define only one database range on your worksheet at a time. For example, you might want customer data, product data, and sales data in three separate databases on the worksheet. If you want to use another database on the same worksheet, you need to define the new database.

To redefine a database range

1. Select the new database range (field names and data).
2. Choose Name.
3. In the "define name" field, type **database**

If you have several databases on one worksheet, you may want to set up a macro that renames them for you. For more information on macros, see Chapter 9, "Running Macros."

Example You can define a database range on a worksheet called SPDATA.MOD to keep Spencer Ceramics' daily sales.

1. Load the SPDATA.MOD worksheet.

   The example files are on the Setup disk; run the SETUP program to copy the files, if you haven't already done so.

2. With the cell pointer in R1C1, type **:** (a colon) to select a range.
3. Move the cell pointer to R10C6.
4. Choose Name.
5. In the "define name" field, type **database**
6. Press Enter.

Row 1 contains the field names.

Rows 2 through 10 are records.

```
#1      1          2                    3          4          5          6
 1    Date       Client's Name      Item Number Quantity    Price      Total
 2 Mar 23, 1990 Williams, M.          000-022       3      $109.95    $329.85
 3 Mar 23, 1990 Johnson, R.           000-045       1      $79.95     $79.95
 4 Mar 23, 1990 Braun, L.             000-027       4      $49.50     $198.00
 5 Mar 23, 1990 Smith, A.             000-043       1      $69.45     $69.45
 6 Mar 26, 1990 Brown, E.             000-029      23      $12.95     $297.85
 7 Mar 26, 1990 Smith, P. & Smith, R. 000-031      20      $13.50     $270.00
 8 Mar 26, 1990 Carlton, B.           000-060       2      $89.00     $178.00
 9 Mar 26, 1990 Roberts, C.           000-052       2      $92.45     $184.90
10 Mar 27, 1990 Martin, C.            000-054      10       $9.45     $94.50
11
12
13
14
15
16
17
18
19
20
NAME  define name: database          to refer to: R1C1:R10C6
      macro: Yes(No)                 command key(s):
Enter name
R1C1      "Date"                  ? ! 100% Free    Multiplan      SPDATA.MOD
```

Name the range "database."

The database includes the field names and all records.

7. Clear the worksheet or quit Multiplan without saving your changes. Choose Transfer Clear All and press N, or choose Quit and press N.

Understanding Criteria

After you have created a database, you use criteria to tell Multiplan what database records you want to search for, extract, or delete. For example, you could use criteria in a company's customer database to find all the records of customers who live in Florida or who have purchased more than $100 worth of products in the past year.

You specify criteria in a criteria range, and then use the Run Database commands with those criteria to search for, extract, or delete records..

Entering Criteria

There are two types of criteria: **comparison criteria** and **computed criteria**. You enter comparison criteria to match values in one database field to numbers or text. For example, you might use a comparison criterion in a database of invoices to find records where a balance due is greater than 500, or where the company name begins with the letter C.

You enter computed criteria to find records based on the relationship within a record, from field to field. For example, you might use computed criteria in a database of cash flow to find records that have an "Expenses" field greater than the "Sales" field (in the same record). You cannot find information in this way using comparison criteria.

The first row of a criteria range is always used for criteria names. You type the criteria below the criteria names. You do not have to enter a criterion under every criteria name. If a criterion cell is blank, Multiplan ignores it when comparing criteria.

Before you define the criteria range, you need to enter comparison criteria, computed criteria, or combined criteria.

Detailed information on entering comparison, computed, and combined criteria is included in the next section, "Setting Up a Criteria Range."

Setting Up a Criteria Range

The criteria range can consist of any area on the same worksheet as the database that is outside the database range. If you change the criteria frequently, put your criteria range where it is easy to edit. For example, you may want the criteria range just above the database, or to one side of the database.

Setting up a criteria range is very much like setting up a database range: both have headings in the first row and both ranges must be named. To set up a criteria range, you'll enter the criteria names and the criteria, and then name the criteria range.

NOTE You can specify the same field name more than once in a criteria range.

To define a criteria range

1. Enter the criteria names in the first row of the area that will become the criteria range.
2. Enter the criteria in the rows below the criteria names.
3. Move the cell pointer to the upper-left corner of the criteria range.
4. Type **:** to select a range.
5. Move the cell pointer to the opposite corner of the criteria range.
6. Choose Name.
7. In the "define name" field, type **criteria**
8. Press Enter.

Multiplan creates the criteria range. You can include new records anywhere within the criteria range without having to redefine the range. If you add rows to the end of the criteria range, however, you need to redefine the criteria range.

You can have more than one criteria range on the same worksheet, but you can define and use only one criteria range at a time. For example, you might have separate criteria for your customer, product, and sales databases, in three different locations on the worksheet. If you want to use another criteria range on the same worksheet, you need to define the new criteria range.

To redefine a criteria range

1. Select the new criteria range (criteria names and criteria).
2. Choose Name.
3. In the "define name" field, type **criteria**

If you have several criteria ranges on a worksheet, you may want to set up a macro that renames them for you. For more information on macros, see Chapter 9, "Running Macros."

Entering Comparison Criteria

You use comparison criteria if you want to find records whose data matches or falls within certain limits of specified criteria. Comparison criteria:

- Must have a criterion name that is the name of the database field you want to examine.
- Must be a value, a formula, or a text item; or must begin with a logical operator (explained later in this chapter) followed by one or more values, formulas, or text items; or it can be blank, meaning that it can match anything.

When you are using comparison criteria, you use database field names as comparison criteria names. The comparison criteria names should be identical to the database field names (capitalization is ignored). These names must appear in the first row of the criteria range. You need only include the names of fields you are interested in, in any order. Criteria names can be either text or formulas that produce text. You can repeat criteria names within a criteria range.

The easiest way to enter comparison criteria names is to copy the database field names to the first row of the criteria range.

NOTE The arrangement of criteria affects Multiplan's search speed. Multiplan uses the leftmost criterion first, then the one to its right, and so on. For faster searches through a large database, put the simplest criteria first, followed by more complex criteria. The order should be: numbers, numbers with comparison criteria, text, text with comparison criteria, and then computed criteria.

Using Values as Comparison Criteria

Once you have set up the comparison criteria names you can enter comparison criteria. The simplest comparison criteria is a value. For example, if you enter 12.95 under the comparison criteria name "Price," Multiplan looks for records in the database with a value of $12.95 in the "Price" fields.

Using Logical Operators in Comparison Criteria

You can also use **logical operators** with values and formulas. The six logical operators are:

Operator	Meaning
=	Equal to
>	Greater than
<	Less than
>=	Greater than or equal to
<=	Less than or equal to
<>	Not equal to

For example, to find all records with a transaction total of greater than $100, you would choose the Alpha command and type **>100** as your criterion under the "Total" field. Similarly, to find all records for the last 30 days you could use the criterion <=NOW()-30 under the "Date" field.

For more information on logical operators, see Chapter 7, "Conditional Formulas."

Using Text in Comparison Criteria

When you type text as a comparison criterion, Multiplan matches everything that begins with what you type. For example, if you type **br** Multiplan finds records for both "Brown, E." and "Braun, L."

You can also search for specific text items by using the logical operators and an ampersand (&). The ampersand tells Multiplan that everything that follows the logical operator is text, and to search for no more text than specified. For example, to search for "Roberts" (but not "Roberts, C.") in the "Client's Name" field, you would choose the Alpha command, and then type **=&roberts** under the "Client's Name" comparison criteria name.

Ampersands appearing within text are treated as text; for example, **=&Smith, P. & Smith, R.** would find "Smith, P. & Smith, R." If you want an ampersand as the first character in a text item, you must use a double ampersand (&&).

Using Wildcards in Comparison Criteria

You can use wildcards to find text that shares some characters but not others. A wildcard is a special character that stands for other characters in text. Multiplan recognizes two wildcards:

Character	Meaning
? (question mark)	Any single character in the same position as the question mark
* (asterisk)	Any number of characters in the same position as the asterisk

The comparison criterion **=&Smith*** finds all entries beginning with Smith. The comparison criterion **=&c???** finds all entries beginning with c and followed by any three characters.

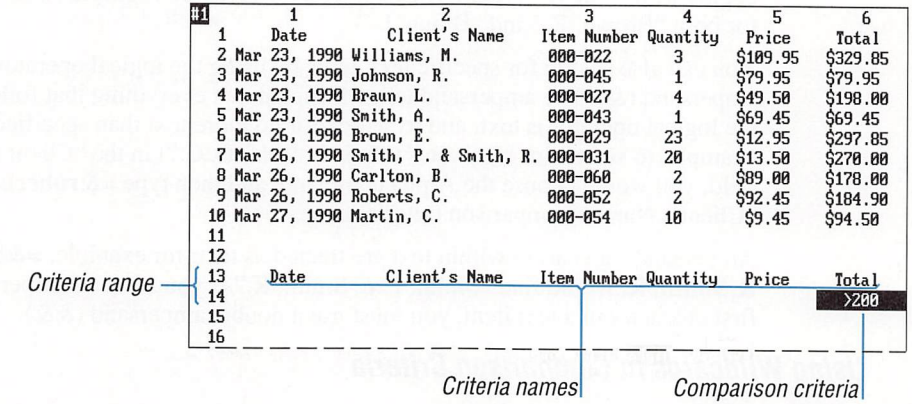
To find an actual question mark or asterisk, precede it with a tilde (~).

Using Named References in Comparison Criteria

If you use a logical operator with a defined name, Multiplan treats the text following the operator as a formula, and evaluates it before performing the search. For example, if you have the name "Total_Amount" defined on your worksheet, and "Total_Amount" has the value of 200, Multiplan treats the criterion =Total_Amount as =200. If "Total_Amount" evaluates to the text item "test input," Multiplan treats the same criterion as the text "test input."

You can combine criteria to find records that match values within a certain range. For information on how to do this, see "Combining Criteria" later in this chapter.

Example You can set up a comparison criteria range for clients whose total order is greater than $200. You do not need to open a worksheet for this exercise.



#1	1	2	3	4	5	6
1	Date	Client's Name	Item Number	Quantity	Price	Total
2	Mar 23, 1990	Williams, M.	000-022	3	$109.95	$329.85
3	Mar 23, 1990	Johnson, R.	000-045	1	$79.95	$79.95
4	Mar 23, 1990	Braun, L.	000-027	4	$49.50	$198.00
5	Mar 23, 1990	Smith, A.	000-043	1	$69.45	$69.45
6	Mar 26, 1990	Brown, E.	000-029	23	$12.95	$297.85
7	Mar 26, 1990	Smith, P. & Smith, R.	000-031	20	$13.50	$270.00
8	Mar 26, 1990	Carlton, B.	000-060	2	$89.00	$178.00
9	Mar 26, 1990	Roberts, C.	000-052	2	$92.45	$184.90
10	Mar 27, 1990	Martin, C.	000-054	10	$9.45	$94.50
11						
12						
13	Date	Client's Name	Item Number	Quantity	Price	Total
14						>200
15						
16						

Entering Computed Criteria

You use computed criteria to find database records that are based on the value of one or more fields within the same record. A computed criterion:

- Must start with a blank cell or a computed criterion name that is not the name of any database field.
- Must contain at least one database field name in its formula.
- Must evaluate to TRUE or FALSE.

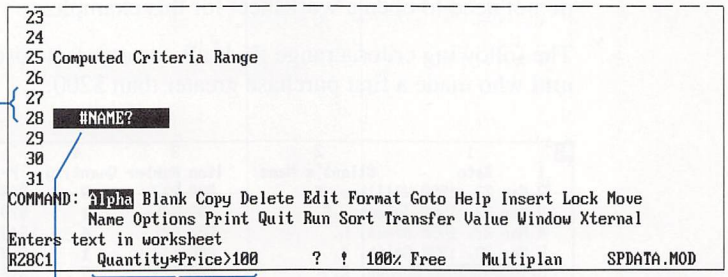
A computed criterion name can be anything except the name of a database field; otherwise, Multiplan tries to interpret the criterion under the name as a comparison criterion. Generally, you should create computed criteria names that explain the computed criteria.

Because the criteria names do not identify the database fields to use, computed criteria must refer to at least one database field name, and may also refer to an absolute reference in addition to the database field name. Type the criteria below each criteria name.

Computed criteria are formulas. The formulas can also refer to names or values outside the database. When you refer to a value outside the database, use an absolute reference to allow for sorting or expansion of data. Multiplan checks names in computed criteria formulas first, to see if they are field names in the database. If they are not field names, they must be valid names on the worksheet.

Multiplan evaluates the formula once for each record and selects the record if the formula's result is TRUE or a number other than zero. Multiplan does not select the record if the formula's result is FALSE, zero, or a text value or error value.

Example If your database did not have a "Total" field, you could still find the records of customers whose total order exceeds $100 by setting up a computed criteria range to multiply the Quantity and Price within each record. You do not need to open a worksheet for this exercise.



Criteria range. The first cell in the range must be blank or contain a criteria name different from any database field name.

A computed criterion must contain at least one database field name and evaluate to TRUE or FALSE.

Multiplan resolves the #NAME? error, replacing "Quantity" and "Price" with values, as it searches for records.

Combining Criteria

You can combine comparison and computed criteria to find records that match more than one criterion or match some combination of several criteria.

There are three ways to use combined criteria:

- To find records that match one criterion **and** another criterion (for example, to find records of clients whose last name begins with B **and** who made a purchase greater than $200).
- To find records that match one criterion **or** another criterion (for example, to select records of clients who bought quantities of less than 3 **or** greater than 19).
- To find any combination of "and's" and "or's" (for example, to find records of customers who spent more than $200 on their purchase **and** who bought quantities of less than 3 **or** more than 19).

You specify "and's" and "or's" by where you position different criteria within the criteria range. To connect criteria with an "and" relation, enter them in the same row. If the "and" applies to the same field name (for example, Total>100 and Total<200), then you must duplicate the field name. To connect criteria with an "or" relation, enter them in different rows. You must rename the criteria range if you add rows to an already named criteria range. Multiplan finds any records that meet all the criteria in any one row of the criteria range.

Example The illustrations in this example show different ways to combine criteria. You do not need to open a worksheet for this example.

The following criteria range finds all customers whose last name begins with B **and** who made a first purchase greater than $200.

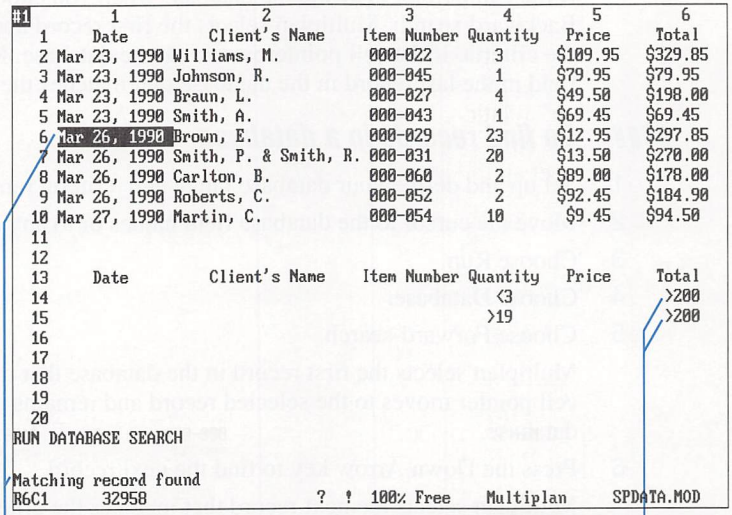
```
#1        1            2                  3          4          5          6
   1      Date         Client's Name      Item Number Quantity   Price      Total
   2  Mar 23, 1990 Williams, M.            000-022        3     $109.95 .  $329.85
   3  Mar 23, 1990 Johnson, R.             000-045        1     $79.95     $79.95
   4  Mar 23, 1990 Braun, L.               000-027        4     $49.50     $198.00
   5  Mar 23, 1990 Smith, A.               000-043        1     $69.45     $69.45
   6  Mar 26, 1990 Brown, E.               000-029       23     $12.95     $297.85
   7  Mar 26, 1990 Smith, P. & Smith, R.   000-031       20     $13.50     $270.00
   8  Mar 26, 1990 Carlton, B.             000-060        2     $89.00     $178.00
   9  Mar 26, 1990 Roberts, C.             000-052        2     $92.45     $184.90
  10  Mar 27, 1990 Martin, C.              000-054       10     $9.45      $94.50
  11
  12
  13      Date         Client's Name      Item Number Quantity   Price      Total
  14                =&b*                                                    >200
  15
  16
  17
  18
  19
  20
RUN DATABASE SEARCH

Matching record found
R6C1      32958                    ? !  100% Free    Multiplan     SPDATA.MOD
```

Multiplan selects the first matching record.

Enter AND criteria in the same row.

The following criteria range finds records of all customers who spent more than $200 on their purchase **and** who bought quantities of less than 3 **or** more than 19.



```
#1        1                2                3          4          5          6
   1      Date             Client's Name    Item Number Quantity  Price      Total
   2 Mar 23, 1990 Williams, M.              000-022        3      $109.95    $329.85
   3 Mar 23, 1990 Johnson, R.               000-045        1      $79.95     $79.95
   4 Mar 23, 1990 Braun, L.                 000-027        4      $49.50     $198.00
   5 Mar 23, 1990 Smith, A.                 000-043        1      $69.45     $69.45
   6 Mar 26, 1990 Brown, E.                 000-029       23      $12.95     $297.85
   7 Mar 26, 1990 Smith, P. & Smith, R.     000-031       20      $13.50     $270.00
   8 Mar 26, 1990 Carlton, B.               000-060        2      $89.00     $178.00
   9 Mar 26, 1990 Roberts, C.               000-052        2      $92.45     $184.90
  10 Mar 27, 1990 Martin, C.                000-054       10      $9.45      $94.50
  11
  12
  13     Date          Client's Name    Item Number Quantity  Price      Total
  14                                                  <3                   >200
  15                                                  >19                  >200
  16
  17
  18
  19
  20
RUN DATABASE SEARCH

Matching record found
R6C1      32958                    ?  !  100% Free    Multiplan      SPDATA.MOD
```

Multiplan selects the first matching record.

Enter OR criteria in different rows.

Using Database Commands

After you have set up your database and your criteria range, you can use database commands to:

- Find records.
- Extract records (find records and copy them to another part of the worksheet or to another worksheet).
- Delete records.

Finding Records

After you set up and define your database, and after you set up and define your criteria range, you can search for records that match the criteria by choosing Run Database Forward-search or Run Database Backward-search.

If the cell pointer is inside the database when you choose Run Database Forward-search, Multiplan selects the first record below the cursor that matches the criteria. The cell pointer moves to the selected record but stays in the same field. If the cell pointer is outside the database, Multiplan selects the first record in the database that matches the criteria.

If the cell pointer is inside the database when you choose Run Database Backward-search, Multiplan selects the first record above the cursor that matches the criteria. If the cell pointer is outside the database, Multiplan selects the first field in the last record in the database that matches the criteria.

To find records in a database

1. Set up and define your database range and criteria range.
2. Move the cursor to the database field names or to any cell outside the database.
3. Choose Run.
4. Choose Database.
5. Choose Forward-search.

   Multiplan selects the first record in the database that matches the criteria. The cell pointer moves to the selected record and remains in the first field in the database.
6. Press the Down Arrow key to find the next record.

   Multiplan selects the next record that matches the criteria. Press the Down Arrow key repeatedly to search for more records. If there are no more records that match the criteria in the direction of the search, Multiplan displays the message *Not found.*
7. Press Esc to return to the command menu.

If you want to search your database backwards, move the cell pointer outside of the database, and choose Run Database Backward-search.

When you are using the Run Database Forward-search and Run Database Backward-search commands, your movement is restricted to those records that match the criteria.

Once you have chosen either Run Database Forward-search or Run Database Backward-search, you may search up or down in the database by pressing the appropriate key:

Press	To move
The Down Arrow key	Down to the next matching record
The Up Arrow key	Up to the previous matching record
PgDn	To the first matching record at least one screen down from the selection
PgUp	To the last matching record at least one screen up from the selection

If there are no matching records in the direction you scroll, Multiplan displays the *Not found* message and does not change the selection.

To end the search and return to the main menu, press Esc or Enter.

Example You can search records in the database on the SPDATA.MOD worksheet for clients whose total order is greater than $200. To do this, you set up the criteria range and use the Run Database Forward-search command to search for the records.

1. Load the SPDATA.MOD worksheet.

   The example files are on the Setup disk; run the SETUP program to copy the files, if you haven't already done so.
2. Define the information in R1C1:R10C6 as a database range.
3. Copy the field names in R1C1:6 to R13C1.
4. Move the cell pointer to R14C6.
5. Choose Alpha and type **>200**
6. Press Enter.
7. Choose Name and enter the following information:
   - in the "define name" field, type **criteria**
   - in the "to refer to" field, type **r13c1:r14c6**

   You can also use the cell pointer or the mouse to define the range.
8. Press Enter.
9. Choose Run.
10. Choose Database.
11. Choose Forward-search.

#1	1	2	3	4	5	6
1	Date	Client's Name	Item Number	Quantity	Price	Total
2	Mar 23, 1990	Williams, M.	000-022	3	$109.95	$329.85
3	Mar 23, 1990	Johnson, R.	000-045	1	$79.95	$79.95
4	Mar 23, 1990	Braun, L.	000-027	4	$49.50	$198.00
5	Mar 23, 1990	Smith, A.	000-043	1	$69.45	$69.45
6	Mar 26, 1990	Brown, E.	000-029	23	$12.95	$297.85
7	Mar 26, 1990	Smith, P. & Smith, R.	000-031	20	$13.50	$270.00
8	Mar 26, 1990	Carlton, B.	000-060	2	$89.00	$178.00
9	Mar 26, 1990	Roberts, C.	000-052	2	$92.45	$184.90
10	Mar 27, 1990	Martin, C.	000-054	10	$9.45	$94.50
11						
12						
13	Date	Client's Name	Item Number	Quantity	Price	Total
14						>200
15						
16						
17						
18						
19						
20						

RUN DATABASE SEARCH

Matching record found

R2C1 32955 ? ! 100% Free Multiplan SPDATA.MOD

Multiplan selects the first matching record.

12 Press the Down Arrow key repeatedly to find other records that match the criteria, and then press Esc.

13 Clear the worksheet or quit Multiplan without saving your changes. Choose Transfer Clear All and press N, or choose Quit and press N.

Extracting Records

You can **extract** specified records from the database. Extracting is copying specified fields of records that meet the criteria in the criteria range from a database to another part of the worksheet or to another worksheet.

Before extracting records from a database, you must select an extract range. An **extract range** is a range just like a criteria range or database, except that you do not have to assign a special name to it. You use the Run Database Extract command to select an extract range. The extract range must be outside of your database and your criteria range. The extract range may be on the same worksheet as the database and the criteria range, or it may be on another worksheet.

The first row of your extract range should contain field names identical to those in your database. You do not need to include every field name from your database, but none of the cells in the first row of the extract range can be blank. For example, if your extract range is R16C1:R20C3, then R16C1, R16C2, and R16C3 must each have a field name in them. When you extract, only the fields that you specify in the first row of your extract range will be copied into the extract range.

The criteria determine which records Multiplan retrieves; the field names at the top of the extract range determine which fields within the retrieved records are displayed.

WARNING You should not set up an extract range around data you intend to keep. When you choose the Run Database Extract command, Multiplan clears the entire extract range before it copies the records that match the criteria into the range. If you select only the cells containing the field names as your extract range, the extract range extends from below the field names to as many rows as are in the database. In that case, when you choose the Run Database Extract command, Multiplan clears enough rows to extract every record in the database, if necessary, plus one blank row to indicate where the extraction ended.

If you include a blank row in the criteria range, then when you search for or extract records, Multiplan finds or extracts every record in the database.

To extract data to the extract range

1. Set up and define your database range and criteria range.
2. Move the cell pointer to the part of the worksheet you want to extract to and type the field names corresponding to the records you want to extract (or copy all of the field names from the field name row of the database).
3. Choose Run.
4. Choose Database.
5. Choose Extract.
6. In the "to cells" field, type the reference of the extract range or select it by moving the cell pointer.

   To extract to another loaded worksheet, type the number of that worksheet's window before the cell reference. For example, if the extract range were in R16C1:2 of a worksheet in window 2, you would type 2:R16C1:2; however, the worksheet with the database must be active when you carry out the Run Database Extract command.
7. Press Enter.

   Multiplan copies records from the database to the extract range using the criteria, but displays data from only the fields you specified in step 2. Multiplan reads the database starting at the top regardless of the initial position of the cursor.

   If you set up an extract range that is greater than one row, Multiplan extracts only as many records as will fit in that range. If there are more records than will fit, the *Extract range filled* message appears.

Example You can extract names from the SPDATA1.MOD worksheet for all clients who have placed orders greater than $200. The example worksheet includes the database and criteria range defined to find clients whose total order is greater than $200; you'll set up the extract range and extract the records.

1 Load the SPDATA1.MOD worksheet and move the cell pointer to R16C1.

The example files are on the Setup disk; run the SETUP program to copy the files, if you haven't already done so.

2 Choose Alpha and type **Client's Name**

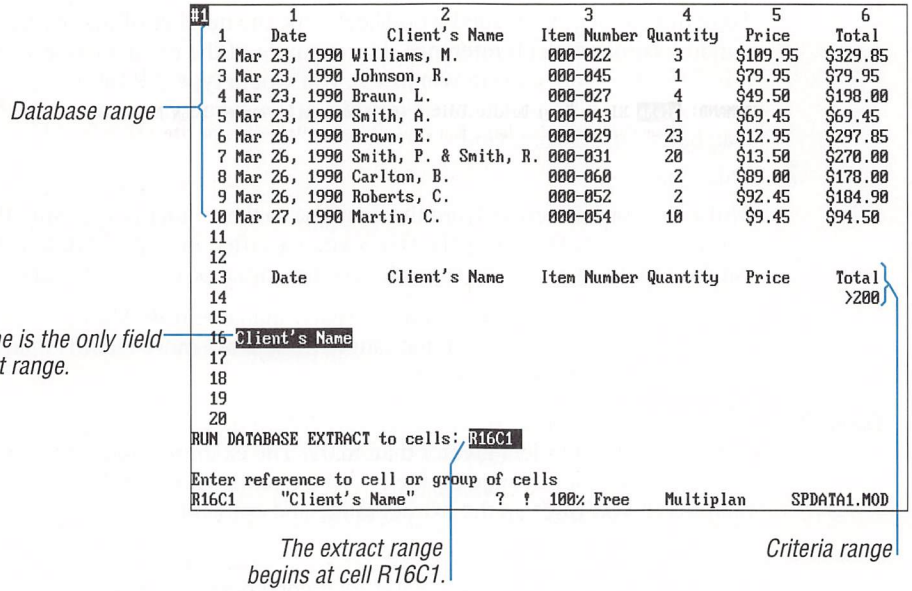
3 Press Enter.

4 Choose Run.

5 Choose Database.

6 Choose Extract.

7 The "to cells" field proposes **r16c1** (the reference of the extract range).



8 Press Enter to accept the proposed response.

These records in the database match the comparison criteria.

Extract range

```
#1        1              2                3          4          5          6
  1     Date         Client's Name    Item Number Quantity    Price      Total
  2 Mar 23, 1990 Williams, M.          000-022       3       $109.95    $329.85
  3 Mar 23, 1990 Johnson, R.           000-045       1       $79.95     $79.95
  4 Mar 23, 1990 Braun, L.             000-027       4       $49.50     $198.00
  5 Mar 23, 1990 Smith, A.             000-043       1       $69.45     $69.45
  6 Mar 26, 1990 Brown, E.             000-029      23       $12.95     $297.85
  7 Mar 26, 1990 Smith, P. & Smith, R. 000-031      20       $13.50     $270.00
  8 Mar 26, 1990 Carlton, B.           000-060       2       $89.00     $178.00
  9 Mar 26, 1990 Roberts, C.           000-052       2       $92.45     $184.90
 10 Mar 27, 1990 Martin, C.            000-054      10        $9.45     $94.50
 11
 12
 13     Date         Client's Name    Item Number Quantity    Price      Total
 14                                                                      >200
 15
 16 Client's Name
 17 Williams, M.
 18 Brown, E.
 19 Smith, P. & S
 20
COMMAND: Alpha Blank Copy Delete Edit Format Goto Help Insert Lock Move
         Name Options Print Quit Run Sort Transfer Value Window Xternal
Enters text in worksheet
R16C1     "Client's Name"          ?  !  100% Free     Multiplan      SPDATA1.MOD
```

Multiplan extracts the clients' names based on the criteria in R13C6:R14C6.

9 Clear the worksheet or quit Multiplan without saving your changes. Choose Transfer Clear All and press N, or choose Quit and press N.

Deleting Records

Use the Run Database Delete command to delete records in the database that match the criteria.

WARNING The Run Database Delete command permanently deletes all records matching the criteria. If you are not sure that the Run Database Delete command will delete only the correct records, save your worksheet before choosing this command. You can see what records will be deleted by creating your criteria, and then extracting using the Run Database Extract command or finding records with the Run Database Search command.

To delete records

1. Set up and define a criteria range specifying the records you want to delete.
2. Move the cursor to the top of your database.
3. Choose Run.
4. Choose Database.
5. Choose Delete.

   Multiplan displays the message *Enter Y to confirm each deletion, N to delete all, or press ESC to cancel.*
6. Press Y to confirm each deletion or N to delete all records matching the criteria.

   Multiplan searches the database starting at the top. If you pressed Y in step 6, then when Multiplan finds a record that matches the criteria, it displays the message *Enter Y to delete, N to skip, or press ESC to cancel.*
7. Press Y to delete the selected record, N to skip the selected record and to find the next record to delete, or Esc to cancel the command and return to the command menu.

Using Database Functions

You can use database functions to compute specific database statistics such as the sum or average of a certain field for all the records of the database that satisfy the criteria. There are 11 worksheet functions specially designed to work with databases. The arguments for these functions are *database,field,criteria* where *field* must be a string of characters enclosed in double quotation marks (""). For example:

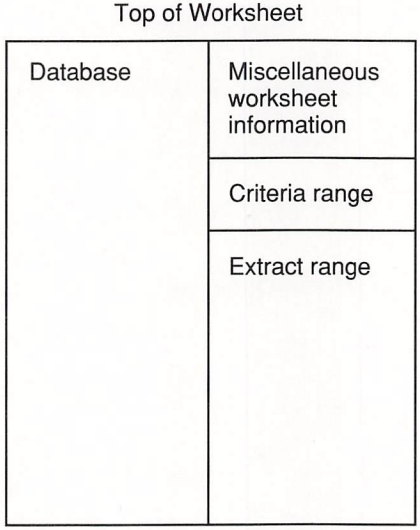
DAVERAGE(database,"price",criteria)

To	Use
Average numbers	DAVERAGE
Count numbers	DCOUNT
Count non-blank cells	DCOUNTA
Find a maximum	DMAX
Find a minimum	DMIN
Multiply numbers	DPRODUCT
Calculate standard deviation	DSTDEV or DSTDEVP
Add numbers	DSUM
Calculate variance	DVAR or DVARP

For more information, see Chapter 14, "Formulas and Functions."

Designing Databases

When you design a database, consider using the following model. With this model, you can add more records to your database easily, and the extract range never writes over other parts of the worksheet..



12 Iteration

With Multiplan you can use **iteration** to solve complex problems. Iteration is the process of repeating a calculation using the results of a previous calculation until a certain condition is met.

Iteration is a very powerful tool, and has applications ranging from producing complex financial information to solving partial differential equations. With iteration, you can do **modeling**, that is, build models with formulas that represent a set of financial or mathematical conditions.

This chapter explains how to:

- Use iteration.
- Start iteration.
- Use the functions that support iteration.
- Create an iteration model.

The first three examples in this chapter depend on one another to show you how to use iteration.

Understanding Iteration

Before you learn how to start iteration, set up an example where you might want to use it.

Example Suppose Spencer Ceramics pays a stock dividend that is equal to 10% of its net profits, and net profits are equal to gross profits minus the dividend payment.

1. Open a new worksheet.
2. Choose Alpha and enter the following information:
   - in R1C1, type **Gross Profits**
   - in R2C1, type **Dividend**
   - in R3C1, type **Net Profits**
3. Choose Name repeatedly to name the following cells:
   - name R3C2 Net_Profits
   - name R2C2 Dividend
   - name R1C2 Gross_Profits
4. In R1C2, type **1000**
5. In R2C2, press = and type the formula **Gross_Profits*10%**
6. In R3C2, press = and type the formula **Gross_Profits-Dividend**
7. Format column 2 with the $#,##0.00; $(#,##0.00) format.

   The dividend is calculated on the gross profits. However, the dividend must be calculated on the net profit instead of the gross.

   Try to change the worksheet so you can enter Net_Profits*10% in R2C2.
8. In R2C2, press = and type the formula **Net_Profits*10%**
9. Press Enter.

   Multiplan sounds a tone and displays the error message, *Circular references unresolved.*

   The error message indicates that you have created a more complicated calculation that requires a different approach. The dividend calculation depends on the net profit. The net profit, in turn, depends on the size of the dividend, which must be subtracted from gross profit to get net profit—a seemingly endless circle. Instead of spending time setting up complex algebraic formulas to solve the problem, you can solve this extended problem using iteration in the example in the "Starting Iteration" section the follows.
10. Choose Transfer Save and save the worksheet as ITERATE.

Starting Iteration

You start iteration and control how it works with the Options command. The fields in the Options command are explained in detail following the procedure.

To start iteration

1. Enter the model on your worksheet.
2. Choose Options.
3. In the "recalc" field, press Y to select Yes if you want Multiplan to recalculate every time you change a cell, or press N to select No if you want to enter all your changes first, and then recalculate, rather than having Multiplan recalculate every time you change a cell.
4. Press Tab twice to move to the "iteration" field, and press Y to select Yes.
5. Press Tab to move to the "test at" field, and set this field to the completion test you want or leave it blank to use DELTA()<0.001 as the completion test.
6. Press Enter.

Multiplan uses iteration to calculate a solution.

Using the Options Command

Selecting Yes in the "iteration" field in the Options command tells Multiplan to start iterating a circular chain of references.

Selecting No in the "recalc" field while making new entries to the worksheet saves time when entering or changing values. This also prevents Multiplan from displaying the *Circular references unresolved* error message.

In the "test at" field, you enter an absolute reference or name to the cell that contains a **completion test**. A completion test is a formula in the cell that returns a logical value (TRUE or FALSE). Multiplan tests the value of the cell after each iteration. If the value is TRUE, Multiplan stops iteration. If the value is FALSE, Multiplan continues iteration.

Storing the test formula in a cell lets you store and display a complex test as a part of the worksheet. If you leave the "test at" field blank, Multiplan applies the formula DELTA()<0.001 as the completion test. For more details about completion tests, see "Using the DELTA Function" later in this chapter, and "DELTA" in Chapter 14, "Formulas and Functions."

Stepping through an iteration model one iteration at a time lets you check the formulas you have entered. To set this up, enter a cell reference that contains TRUE as a response in the "test at" field. If the completion test is always true, Multiplan iterates only once. Press F4 to recalculate repeatedly to produce a step-by-step solution.

NOTE The ITERCNT function returns #N/A at the start of each iteration loop. If you use the method described above, you should avoid using the formula ISNA(ITERCNT()) because it will always return TRUE. For more information, see "Using the ITERCNT Function" later in this chapter, and "ITERCNT" in Chapter 14, "Formulas and Functions."

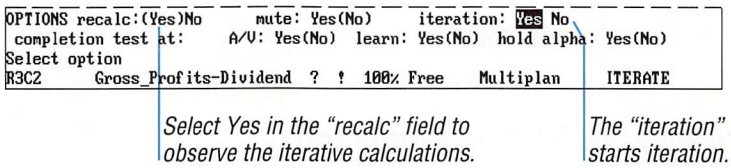
For more information on the Options command, see "Options" in Chapter 13, "Commands."

Example Use iteration to solve the problem from the previous example.

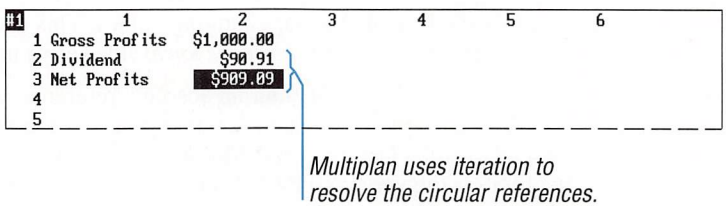
1 Load the ITERATE worksheet you created in the previous example, if it is not already open.

2 Choose Options.

3 In the "iteration" field, press Y to select Yes.



4 Press Enter.



The numbers on the screen change in rapid succession until they reach the solutions $90.91 for Dividend and $909.09 for Net Profits.

5 Choose Transfer Save and save your changes to the ITERATE worksheet so you can try the next example.

Understanding Convergence

When you use iteration, Multiplan performs the calculation and then saves the results and uses them to perform the calculation again. Each iteration generally produces results that are closer and closer approximations of the answer. In the previous example, the solution was produced as follows:

Just before the first iteration, you had the initial values:

Dividend	$90.00
Net Profits	$900.00

The calculations then progressed as follows:

90			
900	900*.1=90		
	1000–90=910	910*.1=91	
		1000–91=909	909*.1=90.9
			1000–90.9=909.1

and so on.

When iteration causes values to become more precise, the process is called **convergence**. Not all models converge. Some models converge only partially; others do not converge at all.

Convergence may also depend on the initial values as well as on the model. Unless you specify otherwise, however, Multiplan stops iteration when the maximum change in all cell values on the worksheet is less than 0.001. This limit assures that the results are precise at least to the penny or percent without jeopardizing the chances for normal termination.

If, for some reason, a model fails to converge within the limit, pressing Esc interrupts the recalculation at the end of the iteration that is in progress.

For more information on the mathematical theories of iterative methods, consult any textbook on numerical analysis.

Stopping Iteration

Press Esc to stop iteration. Other keys are ignored during iteration. Multiplan checks for Esc at the beginning of each iteration. If you press Esc during an iteration, Multiplan completes that iteration, checks the completion test, and finally (if the completion test is not TRUE) stops iteration and displays the *Circular references unresolved* error message. This also means that any characters you type during iteration are not saved, so the type-ahead feature of Multiplan does not work.

The responses in the "iteration" and "test at" fields are saved when the worksheet is saved in Normal mode (for more information, see "Transfer Options" in Chapter 13, "Commands"). When you load a worksheet that contains an iterative model, the fields of the Options command receive the responses saved with the worksheet. If you later start another worksheet, you may want to reselect No in the "iteration" field and delete the response in the "test at" field.

The Iteration Option and Supporting Functions

Multiplan starts iterating at the end of a worksheet recalculation if:

- The worksheet contains at least one circular chain of references.
- The response in the "iteration" field of the Options command is Yes.
- The completion test is not TRUE at the end of the first recalculation.

You use the Options command and the DELTA and ITERCNT functions to support the iteration option.

Using the DELTA Function

The DELTA function returns the maximum absolute value of the changes in values from one iteration to the next. DELTA returns #N/A if No is selected in the "iteration" field.

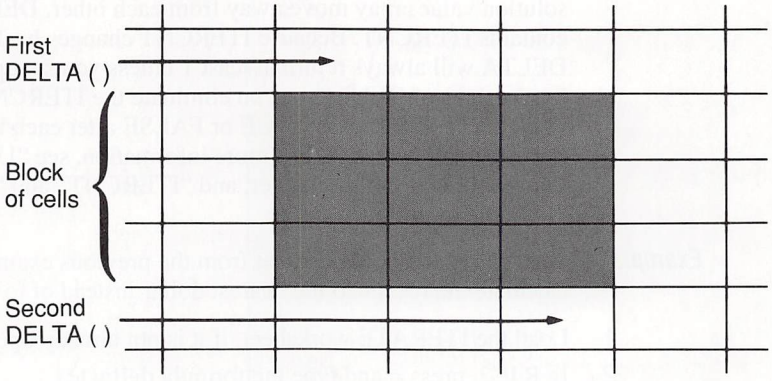
Multiplan counts only the values in the cells that it evaluates between two successive DELTA functions. The DELTA function returns the #N/A error value when ISNA(ITERCNT()) returns TRUE (that is, during the first calculation of an iterative model) because no previous values exist from which to calculate changes.

You can enter the DELTA function in a completion test formula to calculate the results of an iteration to any desired precision. For example, DELTA()<0.000001 returns TRUE when convergence results are less than 0.000001.

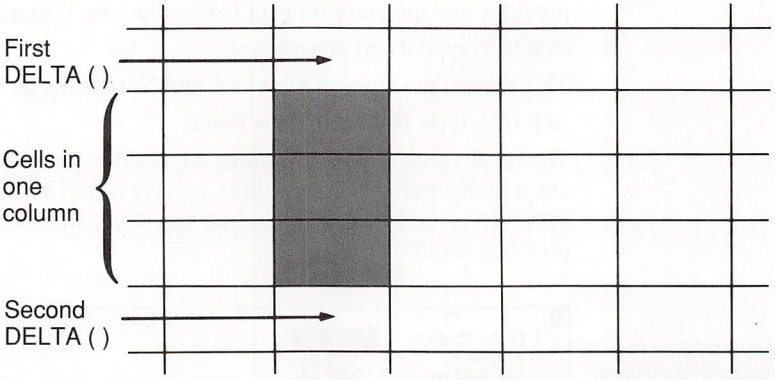
Each time Multiplan encounters a DELTA function, it resets the internal DELTA value to 0. By entering more than one DELTA function, you can isolate the maximum change in a particular part of the worksheet. To create a DELTA function that applies to only part of the worksheet, bracket the cells in that part of the worksheet with cells that contain DELTA functions. Each DELTA function resets the DELTA value to 0.

To avoid problems with order of evaluation, enter the first DELTA function in the cell immediately above the block of cells for which you want a local DELTA value. Then, enter the test DELTA formula in the cell immediately below the block of cells to return a local DELTA value.

The following illustrations show these guidelines:



Multiplan recalculates the block of cells column by column. This model provides local values of DELTA only if these columns contain no other circular references. The next illustration shows a better design model.



Notice that subsequent evaluations of the second DELTA function normally include changes to the cell with the first DELTA function. The simple formula DELTA() is usually not sufficient to isolate local values of DELTA. Instead, enter a formula such as IF(TRUE(),"",DELTA()) which clears the maximum DELTA value while appearing blank on the screen and presenting no value for the following DELTA function to evaluate.

Notice that if you enter the DELTA function as a completion test and enter the ITERCNT function by itself in a model, you may cause **divergence**, that is, the solution values may move away from each other. DELTA also reads the cell that contains ITERCNT. Because ITERCNT changes by 1 during each iteration, DELTA will always return at least 1 unless you set up the worksheet to return local values of DELTA, or you eliminate the ITERCNT formula. The formula ITERCNT()>20 returns TRUE or FALSE after each iteration and therefore would not affect convergence. For more information, see "Using the ITERCNT Function" later in this chapter, and "ITERCNT" and "DELTA" in Chapter 14, "Formulas and Functions."

Example Use the ITERATE worksheet from the previous example and use iteration to calculate the results to the nearest dollar instead of to the nearest penny.

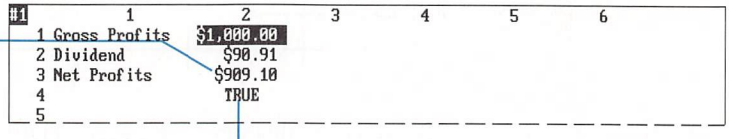
1. Load the ITERATE worksheet, if it is not already open.
2. In R4C2, press = and type the formula **delta()<1**
3. Press Enter.
4. Choose Options.
5. In the "test at" field, type **r4c2** and press Enter.

   The completion test gives a TRUE value when the difference between the previous and the current result is less than one dollar.
6. In R1C2, type **0** and press Enter.

   This resets the values in Dividend and Net Profits as Multiplan recalculates.
7. In R1C2, type **1000** and press Enter.

   The results that Multiplan returns are not the same as before, but are still very close to the more accurate (to-the-penny) result. The net profit is $909.10 ($909.10 is the first result that had less than a one dollar change from the previous result).

Fewer iterations result in a slightly less accurate answer, but it's computed faster.



Multiplan stops iteration when the DELTA function is true.

8. You can choose Transfer Save, save the changes and keep this worksheet or you can delete it by choosing Transfer Delete.

Using the ITERCNT Function

The ITERCNT function returns the current iteration count. During the first recalculation ITERCNT returns the #N/A error value. At the end of each recalculation, Multiplan adds 1 to ITERCNT.

ITERCNT is especially helpful for:

- Providing initial values for iterative models.
- Creating a table of iteration results.
- Providing a completion test.

Initial Values

Many models require an explicit initial value, but a formula for subsequent iterations. To arrange this, substitute a conditional formula (with the IF function) in place of the formula that requires an initial value.

For example, when you calculated dividends in the ITERATE worksheet to start with an initial value of "Initial Net Profit," and then to switch to the formula "Gross Profit Dividend," you would enter this formula:

IF(ISNA(ITERCNT()),Initial_Net_Profit,Gross_Profit–Dividend)

The formula selects Initial Net Profit when the condition is TRUE. When ITERCNT returns the #N/A error value during the first recalculation, ISNA returns TRUE. After that, ITERCNT returns a number, making ISNA return FALSE; then, the IF formula returns the formula Gross Profit–Dividend.

Table of Iteration Results

You can create a table of partial results from an iteration by copying the formula

IF(ITERCNT()=ROW()–9,Net_Profit,RC)

into successive rows starting at row 10. You subtract 9 from ROW() because the formulas start in row 10, and iteration counts from 1.

Notice that each row receives the value of Net Profit during a particular iteration and stays unchanged (RC) for all other iterations, before and after.

Completion Test

Enter a formula that includes ITERCNT in order to limit the number of iterations. For example:

ITERCNT()>20

Enter the cell reference that contains this formula in the "test at" field of the Options command. During subsequent recalculations, Multiplan completes 20 iterations, and then stops.

Creating Iteration Models

Iteration is a powerful problem-solving tool. To illustrate using iteration, three example files are provided on the Setup disk; use the SETUP program to copy the files, if you haven't already done so. Before you begin to study the examples, you should be aware of the order of evaluation Multiplan follows during iteration.

Order of Evaluation

Models with iteration must take into account the order of evaluation of each cell. During iteration, the current values of cells referred to by the formulas affect the iteration. Fortunately, the order of evaluation of cells in circular references is strictly defined when ITERCNT is greater than or equal to 1. Multiplan always calculates these cells one column at a time, top to bottom, starting with the first cell of the first column. If a cell in the column is dependent on other cells in the worksheet, Multiplan calculates the other cells as necessary to provide the supporting information before continuing with the next cell in the column.

A general guideline that helps avoid problems is to place all the circular references in a single column. Care must also be taken that the ordering is correct for iterative methods such as Newton's method (see the second example, "Internal Rate of Return Calculation" on the following page) and binary search (see the third example, "Binary Search to Find Roots of Equations" later in this chapter). In some situations, the order of evaluation determines whether the solution converges or diverges. If the original order of evaluation does not converge, consider changing the order to get it to converge.

Example ***Financial Gap Model*** The discussion in this section is based on the example worksheet GAP.MOD which is included on the Setup disk. Load the GAP.MOD worksheet into Multiplan so you can follow the text in this example. You could also print the worksheet using the "formulas" field in the Print Options command to display the formulas.

This model shows a common business application of iteration for an integrated income statement and balance sheet. Entries and calculations on a balance sheet must satisfy the condition:

total assets = total liabilities + owner's equity

To achieve this balance, you vary the funds surplus and the funds deficit. This is an iterative process because varying the funds alters the interest, which affects the profits, which changes the retained earnings. This circle of calculation throws the worksheet out of balance.

Funds surplus and funds deficit both refer to the value in the "funds" line (R18). Either funds surplus or funds deficit will always equal 0. If the value in the "funds" line is positive, you have funds surplus. If this value is negative, you have funds deficit.

Look at the rows for "funds surplus" and "funds deficit." For funds surplus, the formula MAX(0,funds) returns the value of funds only if funds is positive; otherwise, it returns 0. For funds deficit, the formula –MIN(0,funds) returns the absolute value of funds when funds is negative.

Notice the formula IF(TRUE(),"",DELTA()) in R8C6. This formula keeps the ITERCNT() function in R7C6 from interfering with the DELTA function in R6C6.

The completion test is in R10C6. It checks both the DELTA value and the ITERCNT value. When one of the two returns TRUE (that is, either a maximum DELTA of 0.001 or an ITERCNT of 50), iteration stops.

Columns 3 and 4 show two new time periods. Column 3 shows a large increase in capital outlay and an increase in sales that is not large enough to offset it. Thus, the profit line (R3) shows a loss. In column 4, however, sales have grown enough to offset the capital outlay. The profit line (R3) shows a profit. This is a typical situation in which the effect of a capital outlay on sales is delayed. You can apply these same formulas to analyze how much increase in sales you need to offset a particular capital outlay.

This model can also help you analyze how much money you must borrow at any specific interest rate to receive the usable funds you need.

See the listing of the formulas in the next example.

Example ***Internal Rate of Return Calculation*** The discussion in this section is based on the example worksheet, IRR.MOD, included on the Setup disk. Load the IRR.MOD worksheet into Multiplan so you can follow the text in this example. You could also print the worksheet using the "formulas" field in the Print Options command to print the formulas. The IRR function calculates the internal rate of return. This example shows you how to perform iterated financial calculations and how to use Newton's method when iterating.

In Multiplan, the internal rate of return (IRR) of a group of cash flows is the rate for which:

NPV(rate,cash_flow)=0

The name "cash_flow" refers to the part of the worksheet that contains the cash flows. The formulas in IRR.MOD automatically search for the correct rate.

For this model, the following names are defined:

IRR=R2C2

cash_flow=R3:10C4

The labels in IRR.MOD are as follows:

Label	Represents
IRR	The Internal Rate of Return
NPV	The Net Present Value
NPV'	The first derivative of NPV (used for Newton's method)
EST.IRR	The initial IRR entered by you—an IRR close to 0, such as 1%, usually gives the first positive IRR, which is the one you seek
STATUS	Indicates when the calculation is done
LIMIT	The largest positive IRR to try before trying negative roots

The following section, Newton's Method, briefly describes the mathematical basis of IRR calculation.

Newton's Method

Solving the equation NPV(IRR,cash_flow)=0 for IRR employs the numerical method known as **Newton's method**. This method was first published by Sir Isaac Newton as a solution for a cubic polynomial. Newton's method solves for an initial estimate that is close to a root of the equation, then extrapolates along the tangent at this point along the curve to find its intersection with the x-axis as the next approximation to try. Iteration continues until either successive x values converge or the value of the function converges on 0.

The tangent of a given equation f(x) is the first derivative f '(x). Therefore, Newton's method for successive approximations is:

$$x_{(n+1)} = x_n - (f(x_n)/(f'(x_n))$$

Applying this equation to the solution of the IRR equation produces:

$$IRR_{(n+1)} = IRR_n - (NPV(IRR_n,cash\_flow)/NPV'(IRR_n,cash\_flow))$$

Now, f '(x) becomes:

$$f'(x)=\lim_{delta(x)->0} (f(x+delta(x))-f(x))/delta(x)$$

In our case, with a delta(x) of 0.01 of x, the equation becomes:

$$NPV'(IRR_n,cash\_flow)= (NPV(IRR_n+(IRR_n*0.01),cash\_flow)-NPV(IRR_n))/(IRR_n*0.01)$$

This general method solves many equations that have more than one root, although you must realize that this method may converge to a root different from the expected root or may even diverge if the starting value is not close enough to the root. In the case of IRR, the first root found that is greater than zero is normally the correct answer.

Example ***Binary Search to Find Roots of Equations*** The discussion in this example is based on the example worksheet BINARY.MOD, which is included on the Setup disk.

The IRR formulas in the last example readily adapt to finding the roots of arbitrary equations using the binary search technique.

Assume that you have a polynomial x^3+4x^2+5. Further, suppose that you want to solve for a value of x that yields a result of 30. The following model solves for one root of the polynomial using the binary search technique.

The calculation proceeds as follows:

- Multiplan evaluates the IF formula in R2C2. During the first iteration, ITERCNT returns the #N/A error value, making the ISNA function return TRUE. Thus, IF selects the value of "low," which in this model is 0.
- For all other iterations, ITERCNT returns an integer, making ISNA return FALSE. IF selects the "value-if-false," which is another conditional formula.
- The second IF formula in R2C2 compares the result of using the value of x, calculated in R2C4, in the polynomial f(x) in R2C1 with the desired result, 30, in R6C1. If the value of f(x) is more than 30, IF selects the current value of the cell, which is 0 for the second iteration. If the value of f(x) is less than 30, IF selects the value of x calculated in R2C4.
- The same steps apply to the conditional formula in R2C3, except that this formula selects the "high" value during the first iteration. During subsequent iterations, IF selects the current value of the cell if f(x) is less than 30, or the value of x in R2C4 if f(x) is more than 30.

Once Multiplan begins iteration, the calculations proceed rapidly, and it is difficult to see the numbers clearly before they change. The following list of values for each cell describes, in part, what happens as Multiplan iterates toward a result:

1		2	3	4	5	6
1		0		50	0	100
2		0	100	25	0	100
3		0	50	12.5	0	100
4		0	25	6.25	0	100
5		0	12.5	3.125	0	100
6		0	6.25	1.5625	0	100
7		0	3.125	2.34375	0	100
8		1.5625	3.125		0	100
.						
.						
.						
16	29.999762	2.0352364	2.035284	2.0352602	0	100

At this point, iteration stops because the maximum change in any value is less than 0.001, the internal DELTA value of Multiplan. The root Multiplan calculated is 2.0352721. (The changing values for f(x) in column 1 are left for you to find.)

For more precision, you can enter a DELTA formula in a cell that sets a limit smaller than 0.001, or enter an ITERCNT formula that sets a limit higher than 16 and enter a cell reference in the "test at" field of the Options command.

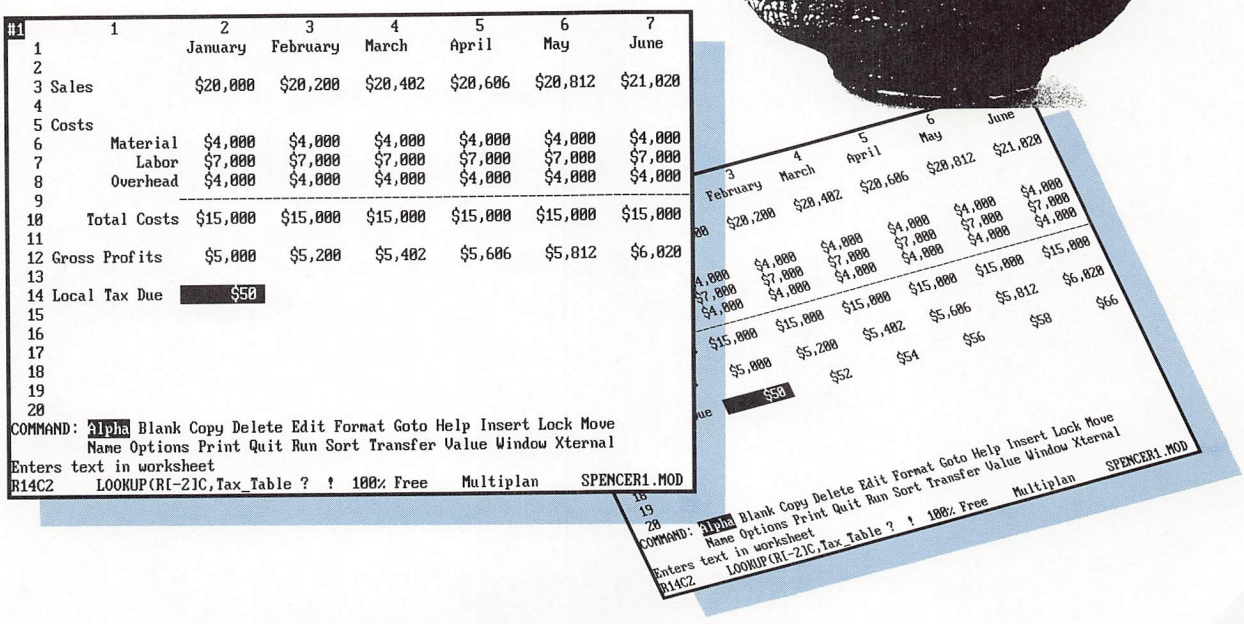
4

Multiplan Reference

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13 Commands

This chapter describes each Multiplan command in alphabetic order.

How to Use This Chapter

At the beginning of each command description, a box encloses the command and its command fields with proposed responses or subcommands.

A short phrase under the boxed command describes what the command does, and the bulleted list that follows describes either the subcommands or how to set the fields. A description of how the command works or how to set the fields in different situations may follow the bulleted list, if the command requires a more detailed explanation.

Subcommands are briefly described following the main command heading. A subcommand is a command that you reach by first choosing another command (for example, Transfer Load is a subcommand of Transfer). Refer to the subcommand descriptions following the main command heading for more detailed information about the subcommand.

Examples are included to show you ways to use the commands.

The "See Also" headings direct you to related commands within this chapter.

Alpha

```
ALPHA:
```

Places text in the active cell.

The Alpha command is the default command when Multiplan is idle (in the top menu), so you can choose Alpha by pressing Enter.

If the active cell already contains text, that text is the proposed response. You can edit the proposed response or begin typing to replace the proposed response entirely. To enter numbers as text, choose the Alpha command first; otherwise, Multiplan treats numeric characters as values.

The first character you type selects the Alpha or Value command. You choose the Value command if you type one of the digits 0 through 9 or one of these characters:

```
= + - . ( "
```

NOTE If you select a comma (,) to be the decimal separator in the Format Options command, the Value command recognizes the comma (,) rather than the period (.).

All other characters you type choose the Alpha command.

Press Enter or any key that moves the cell pointer, such as a direction key, to carry out the Alpha command.

You can enter text or values in successive cells automatically. If either the Alpha or the Value command is carried out by pressing a key that moves the cell pointer, Multiplan moves the cell pointer and displays:

ALPHA/VALUE:

You can continue using direction keys to enter text, numbers, and formulas in successive cells. Multiplan displays the Alpha/Value prompt after each entry until you press Enter or Esc to return to the command menu.

Multiplan also displays the Alpha/Value prompt when you select Yes in the "A/V" field of the Options command.

NOTE Do not choose the Alpha command to clear a cell; choose the Blank command instead.

Examples To enter the text "Net Profit" into the active cell:

ALPHA: Net Profit

To enter the text "Spencer," the text "Sales," and the number "1000" in adjacent cells:

1. Choose Alpha.
2. Type **Spencer** and press the Right Arrow key.
3. Type **Sales** and press the Right Arrow key.
4. Type **1000** and press Enter.

See Also **Copy**
Edit
Format Cells
Format Width
Name
Options
Value

Blank

BLANK cells: R1C1

Clears the contents of a cell or range of cells.

- In the "cells" field, enter the cell or range of cells you want to clear.

By pressing Enter to accept the proposed response, you can quickly clear the contents of the active cell.

The Blank command does not change the format of the cell. The cell is still available for storing values. Choose the Delete command if you want to remove cells from the worksheet and close up the resulting space.

Names are not affected; if you named a cell before choosing the Blank command, that name is still defined.

Note that a blank cell is different from a cell containing one or more spaces. If you use a blank cell in a numeric formula, the formula treats the cell as if it contained zero. If you use a cell containing spaces in a numeric formula, the formula returns the error value #VALUE!.

NOTE A blank cell has a length of 0 when evaluated with the LEN function.

Examples To clear the cell in row 3, column 2:

BLANK cells: R3C2

To clear all cells in the area named "Sales":

BLANK cells: Sales

To clear an irregular area:

BLANK cells: R1:6C1,R7:8

See Also **Delete** **Transfer Clear**

Copy

```
COPY: Right Down From Transpose
```

Presents four ways to copy a cell or group of cells into other cells.

You can copy all information from the source cells to the destination cells, or you can copy just formulas, values, or formats. Copying does not change the source cells unless the destination range overlaps the source range.

- Copy Right copies a cell or column of cells to the right, into the next column or group of columns.
- Copy Down copies a cell or row of cells down, into the next row or group of rows.
- Copy From copies a cell or range of cells to another location on the worksheet.
- Copy Transpose copies and transposes a range of cells to another location on the worksheet. Rows in the source range become columns in the destination, and columns in the source range become rows in the destination.

The Copy subcommands are explained below.

See Also **External Copy** **Move** **Insert**

Copy Down

```
COPY DOWN number of cells:    starting at: R1C1
                  copy:(All)Formula Value Format
```

Copies a cell or row of cells down, into subsequent rows.

Choose Copy Down only if the destination cells are immediately below the source cells.

- In the "number of cells" field, enter the number of cells or rows that you want to copy the source cell or row of cells to. The proposed response for this field is the number you used in the last Copy Down or Copy Right command.
- In the "starting at" field, enter the source cell or row of cells. The proposed response is the position of the cell pointer.

- In the "copy" field, select All to copy all attributes of the source cells, or select Formula, Value, or Format to copy only the formulas, values, or formats.

Examples To copy all attributes of R1C1 into the 10 cells below it:

```
COPY DOWN number of cells: 10    starting at: R1C1
                  copy:(All)Formula Value Format
```

To copy the format of the first five cells in row 1 into the four rows below them:

```
COPY DOWN number of cells: 4     starting at: R1C1:5
                  copy: All Formula Value(Format)
```

See Also **Copy From** **Copy Transpose**
Copy Right

Copy From

```
COPY FROM cells: R1C1                    to cells: R1C1
                  copy:(All)Formula Value Format
```

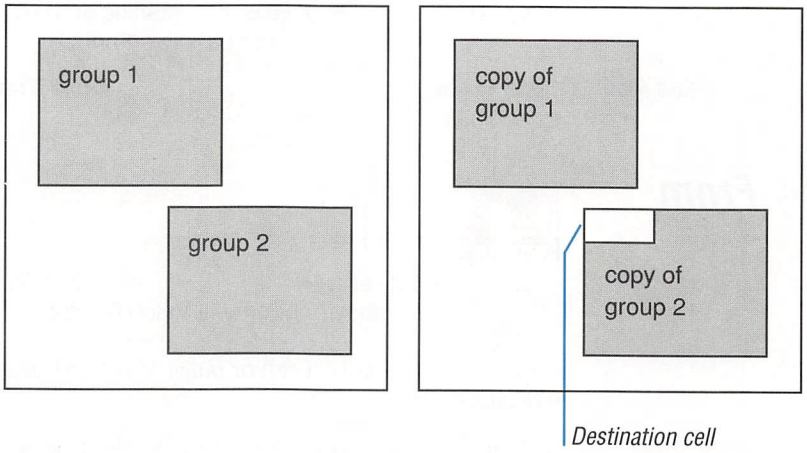
Copies the contents of a cell or range of cells to another location on the worksheet.

- In the "cells" field, enter the source cell or range of cells.
- In the "to cells" field, enter the destination cell, range of cells, or upper-left corner of a range of cells that you want to copy to.
- In the "copy" field, select All if you want to copy all attributes of the source cells, or select Formula, Value, or Format to copy only the formulas, values, or formats.

Setting the Copy From Fields

The proposed response in the "cells" field is the position of the cell pointer. When there is only one source cell in the "cells" field, Multiplan copies its contents into each destination cell. When the source is a range of cells, Multiplan copies the entire range. When you specify only one destination cell in the "to cells" field but the source is a contiguous group of cells, Multiplan automatically selects a destination area that matches the shape of the source, using the destination cell you specify as the upper-left corner.

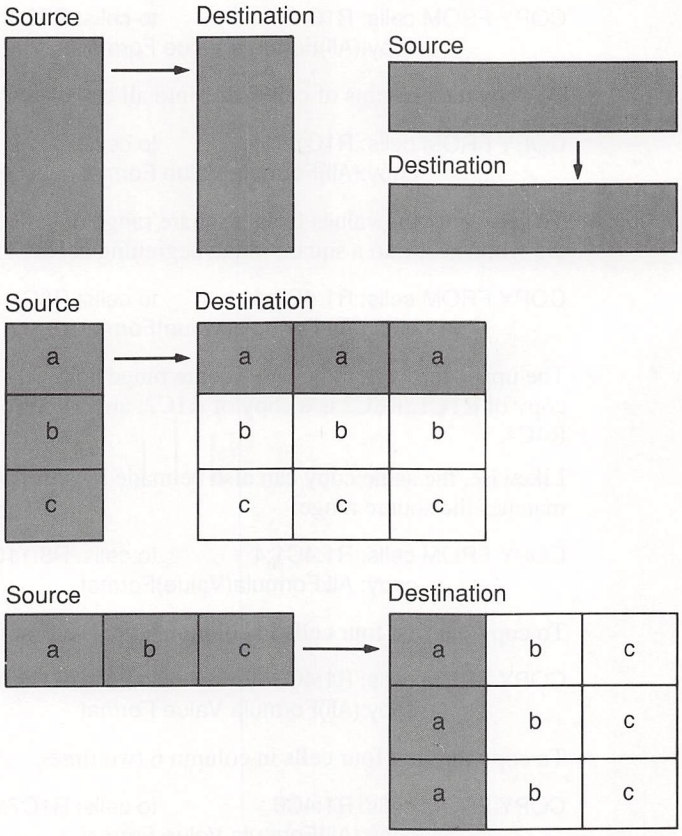
When the source is a list of noncontiguous groups of cells separated by commas, and you specify only one destination cell, Multiplan uses the destination cell as the upper-left corner of a range of cells corresponding to the first group of cells in the list of source cells. For example, the following diagram illustrates the results of copying from GROUP2,GROUP1 to a single destination cell. The single cell becomes the upper-left corner of the copy of GROUP2. Notice that the copy of GROUP1 and GROUP2 are positioned relative to each other in the same way as the source GROUP1 and GROUP2.



Copying Vectors

With Multiplan you can copy **vectors**. A vector is a line of two or more cells in the same row or column. You can copy from a row to a row or from a column to a column if the source and the destination are the same size. If you copy from a row vector to a column vector, or from a column vector to a row vector, the resulting copy is a rectangle in which the source vector is repeated starting at each cell of the target vector.

The following diagram illustrates the results of copying vectors.



If you attempt to copy information incorrectly, Multiplan displays the message, *Not a valid option.*

Examples To copy the contents of cell R1C1 into cell R5C3:

```
COPY FROM cells: R1C1          to cells: R5C3
          copy:(All)Formula Value Format
```

To copy the contents of cell R1C1 into all cells in column 8:

```
COPY FROM cells: R1C1          to cells: C8
          copy:(All)Formula Value Format
```

To copy only the values from a square range of cells in the upper-left corner of the worksheet into a square range beginning at R8C1:

```
COPY FROM cells: R1:4C1:4      to cells: R8C1
          copy: All Formula(Value)Format
```

The upper-left cell of the new square range is R8C1. After the copying, R8C1 is a copy of R1C1, R8C2 is a copy of R1C2, and so on to R11C4, which is a copy of R4C4.

Likewise, the same copy can also be made by specifying a destination range that matches the source range:

```
COPY FROM cells: R1:4C1:4      to cells: R8:11C1:4
          copy: All Formula(Value)Format
```

To copy the first four cells in column 3 into the first four cells in column 6:

```
COPY FROM cells: R1:4C3        to cells: R1:4C6
          copy:(All)Formula Value Format
```

To copy the first four cells in column 6 two times:

```
COPY FROM cells: R1:4C6        to cells: R1C7:8
          copy:(All)Formula Value Format
```

The source cells are part of a column while the destination area is part of a row. The source column is copied down beginning at each cell of the destination.

See Also **Copy Down** **Copy Transpose** **Copy Right**

Copy Right

```
COPY RIGHT number of cells:          starting at: R1C1
          copy:(All)Formula Value Format
```

Copies a cell or column of cells to the right, into the next column or group of columns. Choose Copy Right if the destination cells are immediately to the right of the source cells.

- In the "number of cells" field, enter the number of the destination cells or columns that you want to copy the source cells to. The proposed response for the "number of cells" field is the number you used in the last Copy Down or Copy Right command.
- In the "starting at" field, enter the source cell or column of cells. The proposed response is the position of the cell pointer.
- In the "copy" field, select All if you want to copy all attributes of the source cells, or select Formula, Value, or Format to copy only the formulas, values, or formats.

Examples To copy all attributes of R1C1 into the 10 cells at its right:

```
COPY RIGHT number of cells: 10          starting at: R1C1
          copy:(All)Formula Value Format
```

To copy only the formats of the first five cells in column 1 into the next four columns:

```
COPY RIGHT number of cells: 4          starting at: R1:5C1
          copy: All Formula Value(Format)
```

See Also **Copy Down** **Copy Transpose**
Copy From

Copy Transpose

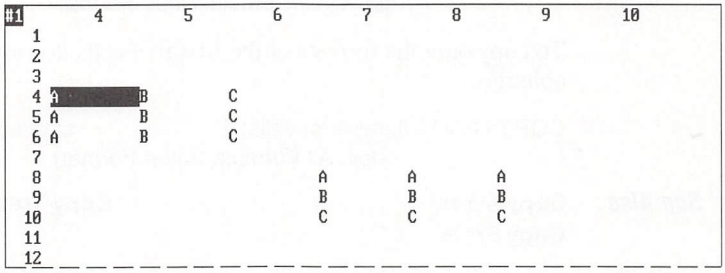
```
COPY TRANSPOSE cells: R1C1          to cells: R1C1
                copy:(All)Formula Value Format
```

Copies and transposes a range of cells to another location on the worksheet. The rows in the source range become columns in the destination, and the columns in the source range become rows in the destination.

- In the "cells" field, enter the source cell or range of cells.
- In the "to cells" field, enter the destination cell, range of cells, or upper-left corner of a range of cells that you want to copy to.
- In the "copy" field, select All if you want to copy all attributes of the source cells, or select Formula, Value, or Format to copy only the formulas, values, or formats.

Example To copy and transpose the range of cells R4C4:R6C6 to the range R8C7:R10C9:

```
COPY TRANSPOSE cells: R4C4:R6C6     to cells: R8C7:R10C9
                copy:(All)Formula Value Format
```



See Also **Copy Down** **Copy Right**
Copy From

Delete

```
DELETE: Row Column
```

Presents two ways to delete cells from the worksheet and close up the resulting space.

- Delete Row deletes a row or rows and moves the remaining rows up.
- Delete Column deletes a column or columns and moves the remaining columns to the left.

Unlike the Blank command, the Delete command does not clear cell contents, but actually removes cells from the worksheet and closes up the remaining space. Multiplan adjusts all references affected by a deletion. For information on how the Delete command affects references, see "Changing the Worksheet" in Appendix C, "Tips and Additional Information About Multiplan."

The Delete subcommands are explained below.

See Also **Blank** **Move**

Delete Column

```
DELETE COLUMN # of columns: 1        starting at: 1
                between rows: 1      and: 4095
```

Deletes all or part of a column or columns.

Choose Delete Column only if you want to remove columns, not just clear their contents.

- In the "# of columns" field, enter the number of columns you want to delete.
- In the "starting at" field, enter the number of the leftmost column in the range you want to delete (type the column number, not the column reference; for example, type **1**, not **c1**). The proposed response is the column that contains the active cell.
- In the "between rows" and "and" fields, enter the number of the rows that enclose the range you want to delete. The Delete Column command is usually used to delete entire columns by accepting the proposed responses of row 1 and row 4095. But when deleting parts of columns, the deletion takes place between (and including) the specified rows. Other rows are not affected.

Columns to the right of the deleted columns move left, and new columns of blank cells are added at the right edge of the worksheet. For information on how deleting affects formulas, references, and named ranges, see "Changing the Worksheet" in Appendix C, "Tips and Additional Information About Multiplan."

Examples To delete all of column 4:

```
DELETE COLUMN # of columns: 1          starting at: 4
                between rows: 1        and: 4095
```

To delete a rectangular area in columns 3 and 4, between rows 3 and 8:

```
DELETE COLUMN # of columns: 2          starting at: 3
                between rows: 3        and: 8
```

The portion of the worksheet in rows 3 through 8 that was to the right of column 4 moves two columns to the left.

See Also **Blank** **Move**

Delete Row

```
DELETE ROW # of rows: 1                starting at: 1
                between columns: 1     and: 255
```

Deletes all or part of a row or rows.

Choose Delete Row only if you want to remove rows, not just clear their contents.

- In the "# of rows" field, enter the number of rows you want to delete.
- In the "starting at" field, enter the number of the uppermost row in the range you want to delete (type the row number, not the row reference; for example, type **1**, not **r1**). The proposed response is the row that contains the active cell.
- In the "between columns" and "and" fields, enter the number of the columns that enclose the range you want to delete. The Delete Row command is usually used to delete entire rows by accepting the proposed responses of column 1 and column 255. But when deleting parts of rows, the deletion takes place between (and including) the specified columns. Other columns are not affected.

Rows below the deleted rows move up, and new rows are added at the bottom of the worksheet. For information on how deleting affects formulas, references, and named ranges, see "Changing the Worksheet" in Appendix C, "Tips and Additional Information About Multiplan."

Examples To delete the active row, row 1:

```
DELETE ROW # of rows: 1          starting at: 1
           between columns: 1    and: 255
```

To delete a rectangular area in rows 6 and 7 between columns 1 and 8:

```
DELETE ROW # of rows: 2          starting at: 6
           between columns: 1    and: 8
```

The portion of the worksheet in columns 1 through 8 that was below rows 6 and 7 moves up two rows.

See Also **Blank** **Move**

Edit

```
EDIT:
```

Edits the text, formula, or value in the active cell.

When you edit text with the Edit command, remember to leave the text in double quotation marks (for example, "text").

When you choose the Edit command, Multiplan displays the active cell's contents in the command line and places the edit cursor at the end of the contents. Edit the contents with the editing keys. For information on how to use the editing keys, see "Editing Command Fields and Cells" in the "Fundamentals" chapter.

After you have edited the cell's contents, press Enter or a direction key to put the contents into the active cell. If you press a direction key to place the contents in the cell, Multiplan changes to the Alpha/Value command rather than returning to the main command menu.

If you press Esc before you press either Enter or one of the direction keys, Multiplan cancels your changes and returns to the main command menu. The information in the cell does not change.

If the cell contains a formula, Multiplan checks the formula for errors when you press Enter or a direction key. If the formula contains an error, the erroneous part is highlighted, and the Edit command remains active.

See Also **Alpha** **Value**

External

```
EXTERNAL: Copy List Total Use Renew
```

Presents a choice of commands for copying, examining, and renewing information from supporting and dependent worksheets.

Choose the External command by pressing X.

An external worksheet is any worksheet that is not the **active** worksheet. The active worksheet is the worksheet that you are using when you perform a command. A supporting worksheet is any worksheet that exports information to another worksheet. A dependent worksheet is any worksheet that imports information from another worksheet. A worksheet can be both supporting and dependent at the same time. For more information on supporting and dependent worksheets, see Chapter 4, "Linking."

- External Copy copies information from supporting worksheets and optionally establishes external links.
- External List displays the lists of supporting and dependent worksheets.
- External Total combines the specified worksheet with the active worksheet on a cell-by-cell basis.
- External Use assigns a substitute name for a specified worksheet.
- External Renew updates information from linked worksheets.

With External Copy, External Total, and External Use, you can select external worksheet files or names from the online list using the direction keys.

The External subcommands are explained below.

External Copy

```
EXTERNAL COPY from sheet:                name:
                        to: R1C1         linked:(Yes)No
```

Copies values from a cell or range of cells on a supporting worksheet to a dependent worksheet.

- In the "from sheet" field, enter the name of the supporting worksheet. If a supporting worksheet has already been defined, it is the proposed response.

- In the "name" field, enter the name or reference of the cell or range of cells that you want to copy from the supporting worksheet.
- In the "to" field, enter the cell reference, range, or upper-left corner of a range of cells that you want to copy to on the dependent, active worksheet. The proposed response is the active cell.
- In the "linked" field, select Yes if you want to establish a permanent link between the dependent, active worksheet and the supporting worksheet, or select No if you want to copy the information just once.

The supporting worksheets must be valid Multiplan files (created by Multiplan version 2.0 or higher) or valid Microsoft Excel files before you can use them with the External Copy command.

NOTE You can use the External Copy command to copy areas named "PUBLIC" from worksheets that are saved with passwords. You cannot copy information from any area of a protected worksheet that is not named "PUBLIC," unless you know the password.

Setting the External Copy Fields

To determine the proposed response for the "from sheet" field, Multiplan looks in the drive and directory entered in the "setup" field of the Transfer Options command. Pressing a direction key displays a list of files (you can use the direction keys whether the "from sheet" field is empty or not); any files to which you have already linked the active worksheet appear at the top of the list and are preceded by an asterisk.

The "name" field may contain a name that is defined on the supporting worksheet to refer to a range of cells, or it may be an absolute reference to a single rectangle on that worksheet, for example, R2C1:12. For more information on absolute references, see "Formulas" in Chapter 14, "Formulas and Functions." Pressing a direction key displays a list of names defined on the worksheet you specified in the "from sheet" field; any names or references on other supporting worksheets to which you have already linked the active worksheet appear at the top of the list and are preceded by an asterisk.

If a single cell is specified in the "to" field, the supporting range of cells is copied starting at that cell. If a range of cells is specified in the "to" field, the shape of that range must correspond to the shape of the range on the supporting worksheet, cell by cell. Otherwise, Multiplan displays an error message and the copy does not occur.

Multiplan checks for blank destination cells. Attempting to copy external information into a cell already containing information causes an error message, and copying is canceled.

Unlike the Copy commands, the External Copy command does not copy formulas; it copies only the values calculated by formulas.

IMPORTANT If the supporting worksheet is already on the screen, Multiplan copies from it, rather than from the saved worksheet file of the same name. Any changes you made to the supporting worksheet are also copied whether you have saved them to the supporting worksheet file or not. This guarantees that you copy the most current information to the dependent worksheet.

Establishing External Links

Selecting Yes in the "linked" field establishes a link between the source information on the supporting worksheet and the destination information on the dependent worksheet. The same worksheet may be in supporting and dependent roles in different external links.

After you establish an external link, every time you load the dependent worksheet with the Transfer Load command or update it with the External Renew command, Multiplan automatically **renews** the dependent worksheet with the latest information from the supporting worksheets.

When you move the cell pointer to any cells you have linked to the supporting worksheet, Multiplan displays the name of the supporting worksheet and the name of the cell or range in square brackets (for example, [SPSALES Monthly_Sales]). This information appears in the status line of the dependent worksheet.

If you select No in the "linked" field, the External Copy command copies values one time only and does not establish a permanent link.

The external link appears as a formula if you select Yes in the "formulas" field in the Format Options command.

NOTE When you choose the Name command immediately after an External Copy, the proposed name on the dependent worksheet consists of the name of the supporting worksheet and the name of the source cells on the supporting worksheet. The proposed response in the "to refer to" field is the destination you specified during the External Copy. For example:

```
NAME define name: SPSALES.Monthly_Sales          to refer to: R3C2:14
     macro: Yes(No)                              command key(s):
```

When defined, you can use this name in other formulas on the dependent worksheet.

Removing External Links

Once you link worksheets, Multiplan locks the destination cells. They can be unlocked only by removing or redefining the external link. To remove a link, enter the supporting worksheet name in the "from sheet" field, enter the range name in the "name" field, press Del in the "to" field, and select Yes in the "linked" field. For more information, see Chapter 4, "Linking."

You can redefine a link to a new destination on the dependent worksheet. Because a source area on a supporting worksheet can be copied only once by each dependent worksheet, the new destination replaces the former one in the link.

IMPORTANT If you plan to delete a dependent worksheet but leave some or all of the supporting worksheets, be sure to use Multiplan's Transfer Delete command, not the DOS or OS/2 Erase command. The Transfer Delete command automatically removes the links between the worksheet you want to delete and all of its dependent and supporting worksheets. For more information, see "Transfer Delete" in this chapter and "Understanding External Relationships" in Chapter 4, "Linking."

Examples

To link the value of the area named "Monthly_Sales" from the worksheet named "SPSALES" to the area starting at cell R3C2 on the active dependent worksheet:

```
EXTERNAL COPY from sheet: SPSALES          name: Monthly_Sales
                          to: R3C2         linked:(Yes)No
```

Assuming that the area named "Monthly_Sales" is a 12-cell-wide part of a row, and the destination for the copy will be R3C2:13, the Name command proposes the following name:

```
NAME define name: SPSALES.Monthly_Sales      to refer to: R3C2:13
     macro: Yes(No)                          command key(s):
```

See Also

External List
External Renew
External Use
Transfer Delete
Transfer Options

External List

EXTERNAL LIST:

Displays the names of worksheets supporting the active worksheet and those dependent on the active worksheet.

The maximum length of the list of names that Multiplan can show is one screen.

The list of supporting worksheets includes any substitute names you define with External Use.

For more information on supporting and dependent relationships, see Chapter 4, "Linking."

Example External List displays information in this format:

Sheets supporting C:\MP\SPENCER

SPSALES

No sheets depend on C:\MP\SPENCER

See Also **External Copy** **External Use**

External Renew

EXTERNAL RENEW:

Renews dependent worksheets by recopying the information from supporting worksheets.

Choose this command to renew dependent worksheets when information on supporting worksheets changes. You can also carry out the External Renew command by pressing Shift+F6.

If the supporting worksheets are themselves dependent on information from other worksheets, you must renew them with the External Renew command before renewing the dependent worksheet. Because Multiplan transfers only the values from supporting worksheets, it does not look at worksheets supporting the supporting worksheets.

If you change the shape of a named range that is linked to a dependent worksheet, and then choose the External Renew command on the dependent worksheet, Multiplan displays the message, *Confirm change: worksheetname areaname.* Similarly, if you delete a named range that is linked to a dependent worksheet,

and then choose the External Renew command on the dependent worksheet, Multiplan displays the message, *Name not defined: name*. In either situation, you can press any key to continue, but Multiplan does not renew this external link on the dependent worksheet.

When Multiplan renews dependent worksheets, it copies information from the most recently saved version of the supporting worksheet's file on the disk unless you have also loaded the supporting worksheet into another window. If another user on a network (or another application running under OS/2) changes a supporting worksheet, and if you want to include these changes when you renew your dependent worksheet, then the other user or application should save the supporting worksheet before you choose External Renew or External Copy. For more information, see "Understanding External Relationships" in Chapter 4, "Linking."

See Also **Transfer Load**

External Total

```
EXTERNAL TOTAL from sheet:                    name: R1:4095
                    starting at: R1C1      operation:(+)–*/
```

Combines the external worksheet with the active worksheet.

Choose External Total when you want to consolidate worksheets for different regions, departments, or time periods. You can consolidate any number of worksheets with the active worksheet.

- In the "from sheet" field, enter the name of the external worksheet you want to combine with the active worksheet. Press a direction key to display a list of worksheets.
- In the "name" field, enter the cell or range of cells on the external worksheet you want combine with the active worksheet. You can specify an absolute reference or a named area. Press a direction key to display a list of names.
- In the "starting at" field, enter the reference of the upper-left corner of a range of cells on the active worksheet where you want the incoming data placed. This cell is matched with the upper leftmost cell of the incoming range you specified in the "name" field.
- In the "operation" field, select the arithmetic operation that you want Multiplan to perform on the incoming information. Selecting "+" adds the incoming cells to the active worksheet. Selecting "–" subtracts the incoming cells from the active worksheet. Selecting "*" multiplies, and specifying "/" divides the incoming cells with the values in the active worksheet.

The incoming information should fit within the limits of the active worksheet. Multiplan ignores any incoming cells that fall outside the borders of the active worksheet (row 4095 and/or column 255). If the incoming information won't fit, set the "starting at" field to a cell that is closer to the upper-left corner of the active worksheet.

Cell contents are imported as text or a value only. When an incoming cell contains a formula, Multiplan takes the result of that formula and imports it as a value. If the incoming cell contains the result of a conditional operation, that result is imported as text. When an incoming value encounters a blank cell, the blank cell is assumed to have a value of zero.

Multiplan combines the incoming worksheet with the active worksheet on a cell-by-cell basis. The table below shows the rules that Multiplan follows when combining cells.

Contents of incoming cell	Contents of active cell	Result of External Total
Text	Value Formula Text	Incoming data is ignored.
Text	Blank cell	Text is inserted into cell.
Value	Text Formula	Incoming data is ignored.
Value	Value Blank cell	Incoming value is added to or subtracted from or is multiplied by or divided with value of active cell.

Multiplan displays an error message if it ignores any incoming information. If several items of incoming data are mismatched, the position of the last mismatched cell remains in the message line.

To combine several incoming worksheets with the active worksheet, you can name the incoming worksheets in the "from sheet" field. Separate the worksheet names with a comma; for example, SPENCER,SPENCOST,BUDGET.

Space in the "from sheet" field is limited, so you may want to rename the worksheets to be combined, adding a numeral to each consecutive worksheet name; for example, SPENCER1,SPENCER2,SPENCER3. You can then select a range in the "from sheet" field by using a colon; for example, SPENCER1:SPENCER3. This would combine all three worksheets. Letters can be used in the same way, so that SPENCERA:SPENCERD would combine SPENCERA, SPENCERB, SPENCERC, and SPENCERD.

NOTE External Total uses only the last character in the worksheet name as a guide to combining worksheets. If you add extensions to your worksheets that end with the same character, such as SPENCER1.MP, SPENCER2.MP, and so forth, "P" becomes the relevant character and the worksheets cannot be combined by specifying a range. Be sure the last character of the name is one that can be incremented.

Example To add a worksheet named "area1" to the active worksheet:

```
EXTERNAL TOTAL from sheet: area1          name: R1:4095
                  starting at: R1C1     operation:(+)–*/
```

To combine SPENCER1, SPENCER2, and SPENCER3 as mentioned in the preceding text:

```
EXTERNAL TOTAL from sheet: spencer1:spencer3   name: R1:4095
                  starting at: R1C1           operation:(+)–*/
```

See Also **External Copy** **Transfer Load**

External Use

EXTERNAL USE filename:	instead of:

Specifies a substitute name for a supporting worksheet.

Choose the External Use command when you have many worksheets that contain similar information organized in the same way and that you use to support a single worksheet.

- In the "filename" field, enter the new name you want to give to an existing supporting worksheet.
- In the "instead of" field, enter the current name of the supporting worksheet. The proposed response is the previous response.

Pressing a direction key in either field displays a list of drives, directories, and files. An asterisk precedes all worksheets that are already linked to the active worksheet. For more information on selecting a file from the online list, see "Selecting a File from the Online List" in the section in this chapter that explains the Transfer Load command.

All references to the worksheet named in the "instead of" field are redirected to the worksheet named in the "filename" field. Multiplan updates any external links from the affected worksheet file.

For example, suppose you create a worksheet each month to show sales expenses, and you use each month's worksheet in a dependent worksheet for a departmental budget. If the format of the monthly worksheets is the same (all names refer to the same areas and same type of information, and so on), you can set up links to a substitute name. With each new month, you then simply change the worksheet referred to by the substitute name, rather than having to unlink the previous month's worksheet and link the new month's worksheet.

Examples

An active worksheet has links to the supporting worksheet BUDGET89. You want to view the figures that result from using the data on BUDGET90, a worksheet identical in format to BUDGET89:

EXTERNAL USE filename: BUDGET90 instead of: BUDGET89

This is faster than removing the links from BUDGET89 and then redefining links to BUDGET90. You can also return to BUDGET89 easily by specifying BUDGET89 in both fields of this command.

As an alternative, you could use a **logical name** when referring to supporting worksheets. A logical name is not the name of a file that contains the data you want to export to a dependent worksheet; instead, it is the name of a "prototype" worksheet used only for setting up external links.

For example, suppose you have several worksheets with budget information (BUDGET89, BUDGET90, and so on). You can create a worksheet called BUDGET and name several ranges of cells in this worksheet that correspond to the pattern of names used in BUDGET89 and BUDGET90, but BUDGET does not have to contain actual data. On a financial summary worksheet, you can establish links to the named ranges on BUDGET. Then, you can choose the External Use command to quickly look at BUDGET89 or any other worksheet using the same pattern of named ranges:

EXTERNAL USE filename: BUDGET89 instead of: BUDGET

All links are changed to refer to BUDGET89. When you want to see the results of your budget for 1990:

EXTERNAL USE filename: BUDGET90 instead of: BUDGET

All links are now changed to refer to BUDGET90.

Format

FORMAT: Cells Default Options Width Replace Style Font

Presents choices for displaying information.

- Format Cells changes the alignment and format of a cell or range of cells.
- Format Default specifies the default alignment, format, and width for all cells, and the worksheet screen height.
- Format Font specifies the font and font size.
- Format Options controls the display of formulas and cell error messages, and the type of decimal separator.
- Format Replace replaces one format with another.
- Format Style controls font styles (bold, underline, italic, and strikethrough).
- Format Width specifies the width of a column or columns.

The appearance of cell contents is controlled by the settings in the "alignment" and "format" fields of the Format Cells command.

The setting in the "alignment" field controls the placement of the contents within the cell. The contents can be centered or left-aligned or right-aligned in the cell.

The setting in the "format" field controls how the value is displayed; for example, as a currency amount, as a percentage, as a decimal value, as a date, or in a different color.

The Default Format Setting

In both the "alignment" and the "format" fields of the Format Cells command, you can specify "default" for the setting. The formatting effects of the default setting are determined by the settings in the "alignment" and "format" fields of the Format Default Cells command. All cells have the default setting initially. When you start Multiplan, cell contents are displayed with the General (Gen) alignment and format. If you insert new rows or columns, the inserted cells have the default setting.

You can change the default settings at any time by choosing one of the Format Default commands. This lets you change the format of all cells that have the default setting.

Specify the most common format you use as the default, and then alter specific cells as necessary with the Format Cells command.

The Format subcommands are explained on the following pages.

See Also **Print Margins** **Print Setup**

Format Cells

FORMAT cells: R1C1 alignment:(Def)Ctr Gen Left Right –
format: Default

Changes the alignment and format settings of a cell or a range of cells.

Choose Format Cells when you want to format only selected cells, not all cells throughout the worksheet, or when you want to review the settings for the active cell.

- In the "cells" field, enter the cell or range of cells you want to format.
- In the "alignment" field, select the alignment you want for displaying cell contents. The proposed response is the alignment setting of the active cell.
- In the "format" field, enter the built-in or custom format you want for displaying information in the cells. You can either type your own format or press a direction key to display a list of available formats. The proposed response is the format setting of the active cell.

Setting the Format Cells Fields

To change the alignment of a group of cells but not the current format setting, enter Ignored (–) in the "format" field. Otherwise, all cells in the range you select receive the format of the active cell. Similarly, if you want to change the format but not the alignment of a range of cells, select – (hyphen) in the "alignment" field.

The alignment options have the following effects.

Alignment	Result
Def	Default; aligns cell contents by the default alignment
Ctr	Center; centers cell contents in the column
Gen	General; aligns text left, numbers right
Left	Aligns cell contents to the left
Right	Aligns cell contents to the right
–	Ignored (hyphen); leaves all alignment codes as they are (used when changing the format of a group of cells while retaining the alignment)

Formats

The following formats are options in the "format" field. Except for Default, @[cont], General, and Ignored, the format choices are combinations of symbols that represent what each format looks like.

Multiplan comes with a number of predefined formats. Press a direction key in the "format" field to see a list of all predefined formats plus any custom formats you have created. The predefined formats are:

Format	Result
Default	Cell contents are displayed with the default format.
@[cont]	Continuous; text longer than the column width is displayed at its full width, crossing into the column on the right if necessary (the cell to the right must be blank and formatted with continuous format also); numbers are displayed in the General format.
0.00	Fixed point; numbers are displayed with two decimal places. The number of decimal places is determined by the number of zeros to the right of the decimal point.
General	Numbers are displayed as precisely as possible in the available width of the cell, with scientific notation used automatically for very large or very small numbers.
0	Integer; numbers with a decimal fraction are rounded to integers.
$#,##0;($#,##0)	Formatted currency; currency amounts are displayed with a comma if they have four or more digits. Negative numbers are shown in parentheses. If there is no number in the cell, the cell displays $0. A local currency symbol may be displayed instead of the $ symbol, depending on your country code setting.
$#,##0.00;($#,##0.00)	Formatted currency; as above, but with two decimal places. If there is no number in the cell, the cell displays $0.00. A local currency symbol may be displayed instead of the $ symbol, depending on your country code setting.

(Continued on the next page)

Format	Result
BAR;(BAR)	Bar graph; numbers appear as an equivalent number of asterisks. If the number is negative, the asterisks are enclosed in parentheses.
0%	Percent; numbers are displayed as percentages with no decimal places. For example, the value .1 is displayed as 10%.
Ignored	The format is left as it is.
#,##0	Formatted numeric; numbers are displayed with commas if they have four or more digits. If no numbers are in the cells, the cells display 0.
#,##0.00	As above, but with two decimal places. If no numbers are in the cells, the cells display 0.00.
0.00%	Percent; numbers are displayed as percentages with two decimals. For example, the value .1 is displayed as 10.00%.
0.00E+00	Exponentiation; numbers are displayed as values, with two decimal places times a power of 10. For example, 2.15E+06 for 2150000.

Speed Formatting

You can quickly choose formatting options in the "format" field by pressing one of the keys in the following table.

Key	Formatting option
C	Continuous ("@[cont]")
D	Default
E	Exponential ("0E+00")
F	Fixed point ("0.00")
G	General
I	Integer ("0")
$	Currency ("$#,##0.00;($#,##0.00)")
*	Bar ("BAR;(BAR)")
%	Percent ("0%")
–(hyphen)	Ignored

Creating Custom Formats

You can use a combination of format symbols and text to create a custom format. You can have a total of 64 predefined and custom formats. For more information on creating custom formats, see Chapter 6, "Dates, Times, and Custom Formats."

Custom formats are stored in the MP.INI file and in the worksheet. Each time you load a worksheet, you can choose the Format Cells command and display a list of Multiplan's predefined formats and all custom formats stored in the worksheet. Similarly, each time you start Multiplan with a new, blank worksheet, you can display a list of predefined formats and any custom formats stored in the MP.INI file. The custom formats stored in the MP.INI file are determined by the most recently saved worksheet. For more information on the MP.INI file, see "The MP.INI File" in Appendix C, "Tips and Additional Information About Multiplan."

If you exit Multiplan with multiple worksheets loaded (and if some of the worksheets have their own custom formats), then the worksheet that is active when you choose the Quit command is the only one that has its custom formats placed in the MP.INI file.

The Transfer Clear commands clear all custom formats.You can clear individual custom formats by choosing the Format Replace command and replacing the custom format with "NONE." For more information, see "Format Replace" later in this chapter.

If you want to copy custom formats from one worksheet to another, choose the Copy From command and set the "copy" field to Format.

Format Symbols and Custom Formats

The following list shows the symbols used in Multiplan formats. You use these same symbols to create custom formats.

Symbol	Result
General	Displays the number in General format.
0	Digit placeholder; if the number entered has fewer digits on either side of the decimal point than there are zeros on either side of the decimal point in the format, Multiplan displays the extra zeros. If the number has more digits to the right of the decimal point than there are zeros to the right in the format, Multiplan rounds the number to as many decimal places as there are zeros to the right. If the number has more digits to the left of the decimal point than there are zeros to the left in the format, Multiplan displays the extra digits.

(Continued on the next page)

Symbol	Result
#	Digit placeholder; follows the same rules as for 0 above, except that Multiplan does not display extra zeros if the number has fewer digits on either side of the decimal point than there are #'s on either side in the format.
.	Decimal point; determines how many digits (0's or #'s) Multiplan displays to the right and left of the decimal point. If the format contains only #'s to the left of this symbol, Multiplan begins numbers less than 1 with a decimal point. To avoid this, use 0 as the first digit placeholder to the left of a decimal point instead of #. Note that the decimal separator is initially determined by the country code setting. You can change the decimal separator from a period to a comma in the "decimal separator" field in the Format Options command.
%	Percentage; Multiplan multiplies by 100 and appends the % character.
,	Thousands separator; Multiplan separates thousands by commas if the format contains a comma surrounded by #'s or 0's. Note that the thousands separator is initially determined by the country code setting. You can change the thousands separator from a comma to a period in the "decimal separator" field in the Format Options command.
E– E+ e– e+	Scientific format; if a format contains one 0 or # to the left of an E–, E+, e– or e+, Multiplan displays the number in scientific format and inserts an E or e. The number of 0's or #'s to the right determines the number of digits in the exponent. Use E– or e– to place a minus sign by negative exponents. Use E+ or e+ to place a minus sign by negative exponents and a plus sign by positive exponents.
" "	Displays whatever text is inside the double quotation marks.

(Continued on the next page)

Symbol	Result
: $ – + ( ) space	Displays that character. To display a character other than one of these, precede the character with a backslash (\) or enclose the character in double quotation marks. Note that the colon, the dollar sign, and the hyphen are also used for speed formatting. If you enter one of these characters when you first move into the "format" field, Multiplan interprets the character as the speed format.
\	Displays the next character in the format. Multiplan does not display the backslash. This is the same as enclosing the next character in double quotation marks. If you want to display a backslash, enter \\.
BAR	Numbers appear as an equivalent number of asterisks.
@	Text placeholder; if there is text in the cell, the text from the cell appears wherever the @ character appears. You can repeat text in a format by entering more than one @ character. For example, @@ will display the text in the cell twice.
m mm mmm mmmm	Displays the month as a number without leading zeros (1–12), as a number with leading zeros (01–12), as an abbreviation (Jan–Dec), or as a full name (January–December). If you use m or mm immediately after the h or hh symbol, Multiplan displays the minute rather than the month.
d dd ddd dddd	Displays the day as a number without leading zeros (1–31), as a number with leading zeros (01–31), as an abbreviation (Sun–Sat), or as a full name (Sunday–Saturday).
yy yyyy	Displays the year as a two-digit number (00–99), or as a four-digit number (1904–2040).
h hh	Displays the hour as a number without leading zeros (0–23), or as a number with leading zeros (00–23). If the format contains an AM or PM, the hour is based on the 12-hour clock. Otherwise, the hour is based on the 24-hour clock.

(Continued on the next page)

Symbol	Result
m mm	Displays the minute as a number without leading zeros (0–59), or as a number with leading zeros (00–59). The m or mm must appear after an h or hh, or Multiplan displays the month rather than the minute.
s ss	Displays the second as a number without leading zeros (0–59), or as a number with leading zeros (00–59).
AM/PM am/pm A/P a/p	Displays the hour using a 12-hour clock. Multiplan displays AM, am, A, or a for times up until noon, and PM, pm, P, or p for times between noon and midnight.
@[cont]	Continuous; data longer than the column width is displayed at its full length, crossing into the column on the right if necessary (the cell to the right must be blank and must have the @[cont] format also); numbers are displayed in Gen format.
[BLACK], [WHITE], [RED], [GREEN], [BLUE], [YELLOW], [MAGENTA], [CYAN]	Changes the color of the characters displayed in the cell to the specified color. You must include the square brackets, but you do not have to type the colors in uppercase letters.

NOTE If you're using the international display option, the $ format symbol represents several currency symbols. The $ that appears in the "format" field of the Format Cells or Format Default Cells commands is actually displayed in cells as a local currency symbol based on the country code setting in your CONFIG.SYS file. For more information, see "Using the International Display Option" in the "Getting Started" chapter and also see your DOS or OS/2 manual.

If you want to include a character in your custom format that is reserved as a format symbol, then enclose the character in double quotation marks or precede it with a backslash. For example, the character h is reserved for hours, but you can include this character in a custom format by typing **"h"** or **\h**.

Number Formats

Multiplan uses the Default format unless you specify a different format. Default format displays numbers in the selection as precisely as possible. If a number is too long to fit in a cell, Multiplan displays the number in scientific notation (for example, 1E+12).

A number format is composed of up to four parts separated by semicolons: up to three number parts and an optional text part. The logical arrangement for a number format is:

positive part;negative part;zero part;text part

For example, here are three number formats you could define to display numbers and text in various ways:

Number format	Result
[blue]General	Displays cell contents in general format with blue characters.
[blue]General;[red]General; [green]General;[cyan]General	Displays cell contents in general format. Positive numbers are blue, negative numbers are red, zero is green, and text is cyan.
[blue]BAR;[red]BAR	Displays cell contents in bar format. Positive numbers are blue and negative numbers are red.

If the format has only one part, such as 0.00, the format applies to all numbers. If the format has two parts, such as 0.00;–0.00, the first part is used for positive numbers and zeros, and the second part for negative numbers. If the format has three parts, such as 0.00;–0.00;"ZERO", the first part is the format used for a positive number, the second part is for a negative number, and the third part is for zero.

A text part, if included, is always the last in the list. Unless it is preceded by three number parts, a text part must include the text character @. For example, the format 0.00;[red](0);"ZERO"[green];"This is text: "@[blue] displays information as follows.

What you type	What you see
25	25.00
-43.4	(43) (displayed in red characters)
0	ZERO (displayed in green characters)
John	This is text: John (displayed in blue characters)

NOTE If you type semicolons with nothing between them, the missing part prevents the corresponding type of number (positive, negative, or zero) from being displayed. For example, the format 0.00;;;@ does not define how to display negative numbers (the second part) or zeros (the third part). Any cells with this format appear blank if they contain negative numbers or zeros.

The following table lists samples of various formats and what is displayed when the cell contains a positive number, a negative number, and a decimal fraction.

Format	When you type: 5	–5	.5
General	5	-5	0.5
0	5	-5	1
0.00	5.00	-5.00	0.50
#,##0	5	-5	1
#,##0.00	5.00	-5.00	0.50
$#,##0;($#,##0)	$5	($5)	$1
$#,##0;[red]($#,##0)	$5	($5)*	$1
$#,##0.00;($#,##0.00)	$5.00	($5.00)	$0.50
$#,##0.00;[red]($#,##0.00)	$5.00	($5.00)*	$0.50
0%	500%	-500%	50%
0.00%	500.00%	-500.00%	50.00%
0.00E+00	5.00E+00	-5.00E+00	5.00E-01

* displays characters in red

NOTE Positive numbers formatted as currency are displayed with a space after the last digit. The extra space is for the closing parenthesis for a negative.

Date and Time Formats

The following table shows how Multiplan's predefined time and date formats display the date and time "March 21, 1991, 18:45:01." You may have different predefined formats depending on the country code setting in your CONFIG.SYS file.

Format	Displays
m/d/yy	3/21/91
m/d	3/21
d-mmm-yy	21-Mar-91
d-mmm	21-Mar
mmm-yy	Mar-91
h:mm AM/PM	6:45 PM
h:mm:ss AM/PM	6:45:01 PM
h:mm	18:45
h:mm:ss	18:45:01
m/d/yy h:mm	3/21/91 18:45

If the Format Cells format is Default, and you enter a time or date in a standard format, Multiplan sets the cell format to the standard format you use. If the cell already has a time or date format, Multiplan uses that format. You can create custom time and date formats by typing time and date format symbols and text in the "format" field. For example, you can use the custom format "dddd, mmmm d, yyyy" to change "3/21/91" into "Wednesday, March 21, 1991". For more information on using and creating time and date formats, see Chapter 6, "Dates, Times, and Custom Formats."

Examples To format R4C6:8 to display times with the format h:mm AM/PM (for example, six o'clock in the evening would be "6:00 PM"):

```
FORMAT cells: R4C6:8          alignment:(Def)Ctr Gen Left Right –
      format: h:mm AM/PM
```

To format R15C5 to display amounts as right-aligned currency, with negative amounts displayed in red enclosed by parentheses:

```
FORMAT cells: R15C5           alignment: Def Ctr Gen Left(Right) –
      format: $#,##0.00;[red]($#,##0.00)
```

See Also **Format Default** **Format Style**
Format Options **Format Width**
Format Replace

Format Default

```
FORMAT DEFAULT: Cells Width Height
```

Presents three kinds of defaults you can change.

- Format Default Cells sets the default alignment and the format codes for cells that have the default setting.
- Format Default Height sets the default height of the Multiplan display.
- Format Default Width sets the default width of all columns.

See Also **Format Cells** **Format Width**

Format Default Cells

```
FORMAT DEFAULT CELLS alignment: Ctr(Gen)Left Right
                    format: General
```

Sets the alignment and format for all cells that have the default setting. The initial default alignment and format setting is General (Gen).

The responses in the "alignment" and "format" fields are described in "Format Cells," earlier in this chapter.

Example To set the default format to display amounts as currency:

```
FORMAT DEFAULT CELLS alignment: Ctr(Gen)Left Right
                    format: $#,##0.00;($#,##0.00)
```

Format Default Height

```
FORMAT DEFAULT height in lines: 25
```

Sets the screen height of the Multiplan display.

- In the "height in lines" field, enter the number of text lines you want Multiplan to display.

With a standard monochrome or color graphics adapter (CGA), you can set the screen height from 11 to 25 lines. With an Enhanced Graphics Adapter (EGA) you can set the screen height from 11 to 43 lines, and with a Video Graphics Array (VGA), you can set it from 11 to 50 lines.

Selecting a height less than 25 lines is sometimes useful when running Multiplan under Microsoft Windows.

Example To set the screen height to 43 lines (for an EGA or VGA display):

```
FORMAT DEFAULT height in lines: 43
```

See Also **Format Default Width**

Format Default Width

FORMAT DEFAULT width in chars: 10

Sets the width of all columns that have the default width setting.

- In the "width in chars" field, enter the width (in number of characters) you want for all columns that have the default format setting.

Columns can be from 0 to 64 characters wide. All columns have the default setting initially. You can set the most convenient width as the default with the Format Default Width command, and change specific columns to other widths with the Format Width command.

If a cell contains a value that cannot be displayed in the column width, Multiplan displays a series of number signs (#) instead. (Multiplan displays a series of exclamation marks (!) if you're using the international display option.) You display the entire value by widening the column or by using a different format.

If you set a column to a width of zero, Multiplan does not display the column on the screen and does not print it. You can use the information entered in cells in the column, but you cannot see the information on the worksheet.

You can use these keys to change column widths:

Key	Change in column width
Right Arrow	Increases width by one character
Left Arrow	Decreases width by one character
Up Arrow	Sets width to zero
Down Arrow	Sets width to maximum allowable width (64 characters)
PgDn	Increases width by 5 characters
PgUp	Decreases width by 5 characters



You can also increase the column width one character at a time by pointing to the "width in chars" field with the mouse and clicking the right button.

Example To change all columns to a default width of 12 characters:

FORMAT DEFAULT width in chars: 12

See Also **Format Default Height** **Format Width**

Format Font

```
FORMAT FONT name:                    size:
```

Sets font name and font size. This command works only if you have a PRD file selected in the "printer" field of the Print Setup command.

- In the "name" field, enter the name of the font you want to use when you print your worksheet.
- In the "size" field, enter the point size of the font you want to use when you print your worksheet.

The proposed responses show the current settings of the options. Type the font name and size in the appropriate fields, or press a direction key in the "name" or "size" fields to display a list of available fonts or sizes.

NOTE Since Multiplan supports only monospace fonts, proportionally spaced fonts do not appear on the list when you press a direction key in the "name" field.

Format Options

```
FORMAT OPTIONS error messages: (Yes)No      formulas: Yes(No)
               decimal separator:(.),
```

Sets various display options.

- In the "error messages" field, select Yes if you want to display error values or conditions, such as #DIV/0! and #NUM!. Or select No to have cells with error values or conditions appear blank.
- In the "formulas" field, select Yes if you want to display formulas instead of values in the cells. Select No to display values, as Multiplan normally does.
- In the "decimal separator" field, select a period (.) or a comma (,) as the decimal separator for currency.

The proposed responses show the current settings.

When you display formulas, Multiplan doubles the width of all columns, and cells that contain text display their contents enclosed in double quotation marks.

If you don't want to display all formulas on the worksheet, you can check the formula in a single cell by choosing the Edit command or by moving the cell pointer to the cell; the formula appears in the status line.

The decimal separator is initially determined by the country code setting in your CONFIG.SYS file. Multiplan uses the period if you have not set the country code. Changing the decimal separator affects the entire worksheet, not just cells that have a currency format. When you change the decimal separator from a period to a comma, the following areas are affected:

- All numbers using a period will use a comma as the decimal separator.
- All numbers entered must be entered with a comma instead of a period for the decimal separator.
- Multiplan changes the decimal separator and the thousands separator in formats. For example, the format #,##0.00 changes to #.##0,00 throughout the worksheet.
- Functions using the comma to separate values will use the semicolon (;). For example, the DATE function must be written as DATE(year;month;day). If you try to use a comma in a function, Multiplan displays an error message.
- The union operator, used to separate items in a list, changes from a comma to a semicolon.

Example To display formulas in the cells that contain them:

```
FORMAT OPTIONS error messages: (Yes)No      formulas: (Yes)No
               decimal separator:(.),
```

Format Replace

```
FORMAT Replace: Default                with: Default
```

Replaces all occurrences of a format with another format throughout the entire worksheet.

- In the "replace" field, enter the format you want to remove. Either type the format or press a direction key and select from the list.
- In the "with" field, enter the format you want to add in the place of the one you removed. Either type the format or press a direction key and select from the list.

Custom formats also appear in the list along with Multiplan's built-in formats. You can remove a custom format from a worksheet by replacing it with "NONE."

NOTE When you exit Multiplan, all the custom formats of the active worksheet are stored in the MP.INI file. For more information, see "Format Cells" in this chapter.

Examples To change a format of #,##0 to #,##0.00 (displaying two decimal places):

FORMAT Replace: #,##0 with: #,##0.00

To delete the custom format [blue]0.00:

FORMAT Replace: [blue]0.00 with: None

See Also **Format Cells** **Format Default Cells**

Format Style

```
FORMAT STYLE cells: R1C1    bold: Yes No( – )  underline: Yes No( – )
                    strikethrough: Yes No( – )  italic: Yes No( – )
```

Sets the font style for a cell or range of cells.

You can format a cell or a group of cells to print their contents in bold, underline, strikethrough, italic, or a combination of these styles.

- In the "cells" field, enter the cell or range of cells you want to apply the styles to.
- Select Yes in the other fields to print with the corresponding style. Or select No to print without that style. Select the – (hyphen) to leave the style unchanged from its default setting.

NOTE Styles appear on the printed worksheet, but not on the screen. Some printers may not print certain styles, depending on the printer and printer driver you are using.

Examples To set the cells in the named range TOTALS to print in bold and underlined, but leave other styles unaffected:

FORMAT STYLE cells: TOTALS bold:(Yes)No – underline:(Yes)No –
strikethrough: Yes No(–) italic: Yes No(–)

To set cells R1C1:R10C10 to print underlined, but leave other styles unaffected:

FORMAT STYLE cells: R1C1:R10C10 bold: Yes No(–) underline:(Yes)No –
strikethrough: Yes No(–) italic: Yes No(–)

See Also **Format Cells** **Print Setup**

Format Width

FORMAT WIDTH in chars or d(efault): d column: 1 through: 1

Changes the width of one or more columns to the number of characters you specify.

Columns can be from 0 to 64 characters wide.

- In the "in chars or d(efault)" field, enter the width (in characters) of the column or columns. The initial proposed response is d (for default), similar to the default setting for format and alignment codes.
- In the "column" field, enter the number of the leftmost column in the range you want to widen or narrow (type the column number, not the column reference; for example, type **1**, not **c1**).
- In the "through" field, enter the number of the rightmost column in the range you want to widen or narrow (type the column number, not the column reference).

When d is in the "in chars or d(efault)" field, the column width of all columns is controlled by the Format Default Width command. All columns have the default setting initially. You can set the most convenient width as the default with the Format Default Width command, and change specific columns to other widths with the Format Width command.

If a cell contains text that is wider than the column, Multiplan cuts off the display at the right edge of the column. You can change the column width by choosing the Format Default Width or the Format Width command. You can also choose the Format Cells command and apply the @[cont] (continuous) format to the cell containing the wide text and to adjacent, empty cells.

If a cell contains a value that cannot be displayed in the column width, Multiplan displays a series of number signs (#). (Multiplan displays exclamation marks (!) if you're using the international display option.) You can display the entire value by widening the column, or by using a different format.

If you set a column to a width of zero, the column is not displayed on the screen. You can use the information entered in cells in the column, but you cannot see the information on the worksheet.

You can use these keys to change column widths:

Key	Change in column width
Right Arrow	Increases width by one character
Left Arrow	Decreases width by one character
Up Arrow	Sets width to zero
Down Arrow	Sets width to maximum allowable width (64 characters)
PgDn	Increases width by 5 characters
PgUp	Decreases width by 5 characters



You can also increase the column width one character at a time by pointing to the "in chars or d(efault)" field with the mouse and clicking the right button.

Examples To set column 1 to a width of 12 characters:

FORMAT WIDTH in chars or d(efault): 12 column: 1 through: 1

To set columns 4 through 8 to a width of 20 characters:

FORMAT WIDTH in chars or d(efault): 20 column: 4 through: 8

See Also **Format Default Height** **Format Default Width**

Goto

GOTO: Macro Name Row-col Window

Presents a command to run the macro you specify and three ways to move the cell pointer to a new location.

- Goto Macro runs the specified macro.
- Goto Name makes the first cell of a named area the active cell.
- Goto Row-col makes the specified cell the active cell.
- Goto Window moves the cell pointer to the specified cell in the specified window.

When you choose Goto Name, Goto Row-col, or Goto Window, if a requested cell is already visible in the active window, only the cell pointer is moved. If the requested cell is not visible in the active window, the active window shifts accordingly.

The Goto subcommands are explained on the following pages.

Goto Macro

GOTO macro:

Runs the macro you specify.

- In the "macro" field, enter the name or cell reference of the macro you want to run. You can type the name of the macro or press a direction key to display a list of named macros in all the loaded worksheets.

If you have multiple worksheets loaded then, in the list of named macros, Multiplan displays the name preceded by its window number and a colon. With this feature, you can run macros from different worksheets even if they have the same name. If the same macro name is defined on the active worksheet and on another worksheet, then Multiplan runs the macro on the active worksheet unless you specify a window number.

You cannot use a macro command key sequence with this command. For more information on running macros, see Chapter 9, "Running Macros."

Examples To run a macro named Add_Information, which begins in the cell located at R3C1, you can use the macro name:

GOTO macro: Add_Information

You can also use the cell reference:

GOTO macro: R3C1

See Also **Goto Name**

Goto Name

GOTO name:

Places the cell pointer in the upper-left corner cell of the named range, making that cell the active cell.

- In the "name" field, enter the name of the range you want to go to. Type the name or press a direction key to display a list of available names.

Example To move the cell pointer to the upper-left corner of the area named "COSTS":

GOTO name: COSTS

See Also **Goto Macro** **Goto Row-col**

Goto Row-col

```
GOTO row: 1     column: 1
```

Moves the cell pointer to the selected cell, making that cell the active cell.

- In the "row" field, enter the row number of the cell you want to make active (type the row number, not the row reference; for example, type **1**, not **r1**).
- In the "column" field, enter the column number of the cell you want to make active (type the column number, not the column reference; for example, type **1**, not **c1**).

Examples To move to row 25 in the active column (column 1):

```
GOTO row: 25     column: 1
```

If rows 1 through 20 are visible in the window when you enter this command, the window is shifted so that cell R25C1 is visible in the upper-left portion of the active window.

To move the cell pointer to row 37, column 9:

```
GOTO row: 37     column: 9
```

See Also **Goto Name**

Goto Window

```
GOTO WINDOW window number: 1     row: 1     column: 1
```

Makes the specified window and cell active, and places this cell in the upper-left corner of the active window.

- In the "window number" field, enter the number of the window you want to make active.
- In the "row" field, enter the row number of the cell you want to make active.
- In the "column" field, enter the column number of the cell you want to make active.

If you use this command with the proposed responses, which are the active window and active cell, Multiplan redraws the active window.

Examples To make R5C15 the active cell and to place it in the upper-left corner of window #3:

GOTO WINDOW window number: 3 row: 5 column: 15

To make R90C45 the active cell and to place it in the upper-left corner of window #5:

GOTO WINDOW window number: 5 row: 90 column: 45

See Also **Window Split**

Help

HELP: Resume Start Next Previous
Applications Commands Editing Formulas Keyboard Macro

Provides helpful information about Multiplan.

Multiplan reads Help information from the MP.HLP file. To get general help information, choose the Help command from the main command menu. To get context-sensitive help, press Alt+H, press ?, or click the Help icon (?) with the mouse.

NOTE If you are using the Alpha command, you cannot press ? because Multiplan interprets this as text.

When you request help, Multiplan replaces the worksheet display with text from the Help file, and the Help command menu appears.

The worksheet display resumes when you either choose Resume from the Help menu or press Esc. Resume returns you to where you were when you requested help. Pressing Esc returns you to the main command menu.

If you request help by pressing Alt+H or clicking the Help icon with the mouse, the Help information Multiplan displays depends on what you're doing in the worksheet when you request it.

- If you press Spacebar or Backspace to highlight a command word in a menu, Multiplan describes the command when you request help.
- If the cursor is in a command field, Multiplan describes the command field.
- If the message line shows an error message, Multiplan describes either the previous command or the error message.

If you request help by choosing the Help command from the main command menu, Multiplan displays several help topics. You can request more specific information by choosing one of these topics from the Help menu.

Topic	Shows
Resume	Where you were when you requested help
Start (or Home)	The beginning of the help file
Next (or PgDn)	The next screen of Help information—the information about a subject frequently fills several screens
Previous (or PgUp)	The previous screen of Help information
Applications	A list of common problems paired with the names of the commands that offer solutions
Commands	A description of the first command (Alpha)
Editing	A description of Multiplan editing
Formulas	A list of all functions and the rules about formulas
Keyboard	A list of keys you press to complete certain actions
Macro	A description of macros

Insert

INSERT: Row Column

Inserts new rows or columns into the worksheet.

- Insert Row inserts new rows, moving the rest down.
- Insert Column inserts new columns, moving the rest to the right.

Multiplan adjusts all references affected by the insertion. Multiplan does not perform the Insert command if the insertion would push data off the edge of the worksheet. For example, if you have data in column 255, trying to insert even one column causes the error message, *Not a valid option*. Similarly, if you have data in row 4094 and try to insert two rows, the *Not a valid option* error message appears because the maximum number of rows is 4095. For a description of how the Insert command affects references, see "Changing the Worksheet" in Appendix C, "Tips and Additional Information About Multiplan."

The Insert subcommands are explained on the following pages.

See Also **Copy** **Move**
Delete

Insert Column

```
INSERT COLUMN # of columns: 1          before column: 1
                between rows: 1        and: 4095
```

Inserts all or part of a column or columns.

- In the "# of columns" field, enter the number of columns you want to insert.
- In the "before column" field, enter the column number that is immediately to the right of the insertion point (type the column number, not the column reference; for example, type **1**, not **c1**). The proposed response is the column that contains the active cell.
- In the "between rows" and "and" fields, enter the numbers of the rows that enclose the range you want to insert. The Insert Column command is most commonly used to insert complete columns by accepting the proposed responses of rows 1 and 4095.

Columns to the right of the inserted columns move right.

When you insert parts of columns, the insertion takes place between the specified rows, and other rows are not affected.

Examples To add a column to the left of column 3:

```
INSERT COLUMN # of columns: 1          before column: 3
                between rows: 1        and: 4095
```

To insert a rectangular area in columns 5 and 6 between rows 3 and 8, causing parts of rows 3 through 8 to move to the right:

```
INSERT COLUMN # of columns: 2          before column: 5
                between rows: 3        and: 8
```

See Also **Copy** **Move** **Delete**

Insert Row

```
INSERT ROW # of rows: 1                before row: 1
                between columns: 1     and: 255
```

Inserts all or part of a row or rows.

- In the "# of rows" field, enter the number of rows you want to insert.
- In the "before row" field, enter the row number that is immediately below the insertion point (type the row number, not the row reference; for example, type **1**, not **r1**). The proposed response is the row that contains the active cell.
- In the "between columns" and "and" fields, enter the numbers of the columns that enclose the range you want to insert. The Insert Row command is most commonly used to insert complete rows by accepting the proposed responses of columns 1 and 255.

Rows below the inserted rows move down.

When you insert parts of rows, the insertion takes place between the specified columns. Other columns are not affected.

Examples To insert a new row above row 7:

```
INSERT ROWS # of rows: 1               before row: 7
                between columns: 1     and: 255
```

To insert a rectangular area in rows 4 and 5 between columns 1 and 8, causing the lower parts of columns 1 through 8 to move down:

```
INSERT ROWS # of rows: 2               before row: 4
                between columns: 1     and: 8
```

See Also **Copy** **Move** **Delete**

Lock

LOCK: Cells Formulas

Locks cells with and without formulas to protect them from accidental change.

- Lock Cells locks and unlocks selected cells.
- Lock Formulas locks all cells that contain text or formulas.

You cannot change the values of locked cells by choosing the Alpha, Blank, Copy, Edit, Value, or External commands.

Locked cells are still affected by the Delete, Format Cells, Insert, Move, and Sort commands.

When some cells are locked, pressing F2 moves the cell pointer to the next unlocked cell that is not blank. Similarly, pressing Shift+F2 moves the pointer to the previous unlocked cell that is not blank. By choosing the Lock command and pressing these keys, you can quickly locate variable quantities on a complex worksheet and perform "what if" experiments.

The Lock subcommands are explained below.

Lock Cells

LOCK cells: R1C1 status: Locked(Unlocked)

Displays and changes the protection status of cells.

- In the "cells" field, enter the cell or range of cells you want to lock or unlock.
- In the "status" field, select Locked if you want to lock the range of cells, or select Unlocked if you want to unlock them.

The proposed responses show the status of the active cell.

You cannot use the Lock Cells command to unlock cells that have been locked by the External Copy command. You must first remove external links.

Examples To lock an unlocked active cell (R1C1):

LOCK cells: R1C1 status:(Locked)Unlocked

To unlock the whole worksheet:

LOCK cells: R1:4095 status: Locked(Unlocked)

See Also **External Copy** **Lock Formulas**

Lock Formulas

LOCK FORMULAS:

Locks all cells that contain text or formulas.

When you choose Lock Formulas, Multiplan asks you to *Enter Y to confirm* your decision. Pressing Y locks all cells that contain text or formulas. Cells that contain numbers are not affected.

The Lock Formulas command protects all values generated by formulas but does not keep formulas from being recalculated. Numbers and any entries made after locking are not protected, so you must decide which unlocked cells you want to lock. For information on the difference between text, formulas, and numbers, see Chapter 14 "Formulas and Functions."

See Also **Lock Cells**

Move

MOVE: Row Column

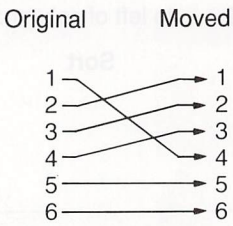
Moves rows or columns from one place to another on the worksheet.

- Move Row moves whole rows.
- Move Column moves whole columns.

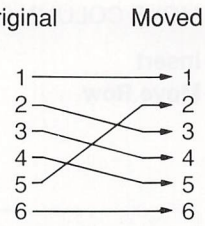
You identify the destination of a move by selecting the row or column that will follow the moved cells. That row or column may or may not be displaced, depending on the direction of the move.

For example, consider the result of moving these rows:

Move 1 to before 5



Move 5 to before 2



When you move cells, Multiplan adjusts all cell references. For information on how the Move command affects the worksheet, see "Changing the Worksheet" in Appendix C, "Tips and Additional Information About Multiplan."

You can move cells by inserting blank cells at the destination, copying the source cells into the destination cells, and then deleting the source cells.

The move subcommands are explained below.

See Also **Copy** **Insert**
Delete **Sort**

Move Column

MOVE COLUMN from column: 1	to left of column: 1	# of columns: 1

Moves a column or group of columns to a new position on the worksheet.

- In the "from column" field, enter the column number of the leftmost column in the group of columns you want to move (type the column number, not the column reference; for example, type **1**, not **c1**).
- In the "to left of column" field, enter the number of the column that will be immediately to the right of the moved columns after you complete the command.
- In the "# of columns" field, enter the number of columns you want to move.

If you want to move a column to column 255, enter 256 in the "to left of column" field.

Example To move columns 9 and 10 to the left edge of the worksheet, moving all columns currently to the left of column 9 to the right two columns to make room:

MOVE COLUMN from column: 9 to left of column: 1 # of columns: 2

See Also **Insert** **Sort**
Move Row

Move Row

MOVE ROW from row: 1 to before row: 1 # of rows: 1

Moves a row or group of rows to a new position on the worksheet.

- In the "from row" field, enter the number of the uppermost row in the group of rows you want to move (type the row number, not the row reference; for example, type **1**, not **r1**).
- In the "to before row" field, enter the number of the row that will be immediately below the moved rows after you complete the command.
- In the "# of rows" field, enter the number of rows you want to move.

If you want to move a row to row 4095, enter 4096 in the "to before row" field.

Example To move row 5 to the top of the worksheet, moving all rows currently above row 5 one row down to make room:

MOVE ROW from row: 5 to before row: 1 # of rows: 1

See Also **Insert** **Sort**
Move Column

Name

NAME define name: to refer to: R1C1
macro: Yes(No) command key(s):

Assigns a name to a cell or range of cells.

Choose the Name command to name a cell or range of cells if you want to refer to that cell or range in a command or formula, or to delete or to redefine a name that you have already defined.

- In the "define name" field, enter the name you want to assign to the cell or range of cells.
- In the "to refer to" field, enter the cell or range of cells.
- In the "macro" field, select Yes if the named range is a macro.
- In the "command key(s)" field, enter the one-letter or two-letter command key sequence you want to assign to your macro, if the named range is a macro.

NOTE To run a macro, press and hold the Alt key and type the command key sequence.

Setting the Name Fields

The proposed response for the "define name" field is either blank or text. If the active cell contains text, Multiplan proposes that text, with any illegal characters removed (such as #, $, *, and so on). This makes it easy to convert a heading for a row or column into a name. It is easier to read formulas if their names correspond to the headings on your worksheet. If you want the name to be something other than the proposed response, type the new response.

Names must begin with a letter, followed by any combination of letters, numbers, the period (.) or the underline character (_). When Multiplan formulates a proposed response based on the contents of the active cell, the response is automatically adjusted to conform to these rules (Multiplan ignores illegal characters and substitutes underline characters for spaces). If you type illegal characters in the "define name" field, Multiplan does not accept your response and moves the cursor to the first illegal character. You must edit the incorrect response and press Enter again, or cancel the command.

Names can be up to 31 characters long and cannot be a combination of characters that could be confused with a reference. For more information on references, see "Cell References" in Chapter 14, "Formulas and Functions."

The proposed response for the "to refer to" field is either the active cell or, if the last name defined was a vector (a portion of a row or column), the same vector shifted to the active row or column. This feature makes defining parallel groups easy. A single name can refer to as many as 20 rectangular areas, each separated by a comma. If the name you enter is already defined, the proposed response in the "to refer to" field shows the current definition after you press Tab.

You must identify a named range as a macro name if you want Multiplan to include the name in the macro name report or if you want the name to appear in a list of macros when you choose the Goto Macro command. For more information on macro name reports, see "Run Report" in this chapter. For more information on using the macros and command key sequences, see Chapter 9, "Running Macros."

Redefining and Deleting Names

To see the names that are already defined, choose the Name command and press a direction key to display a list of defined names. As you highlight the names with the direction keys, the name information appears in the command fields.

To change the definition of a name after viewing it, use the editing keys to alter the response in the "to refer to" field and press Enter.

You delete a name by making it refer to no area. Enter the name you want to delete in the "define name" field; press Tab and then Del to delete the response in the "to refer to" field, and press Enter.

Name Enumeration

When you are entering information with the Value command, you can press F3 followed by a direction key (name enumeration) to display a list of defined names. Highlight a name by pressing the direction keys, and then enter the name in the formula by pressing Enter.

Example To define row 3, columns 2 through 13, with the name Sales:

```
NAME   define name: Sales                    to refer to: R3C2:13
       macro: Yes(No)                  command key(s):
```

See Also **External Copy**

Options

```
OPTIONS recalc:(Yes)No   mute: Yes(No)   iteration: Yes(No)   test at:
A/V: Yes(No)   learn: Yes(No)   old menus: Yes(No)   hold alpha: Yes(No)
```

Sets display and operation options.

- In the "recalc" field, select Yes if you want to recalculate the entire worksheet whenever you change a cell, or select No if you want to recalculate only when you press F4 or when you save the worksheet.
- In the "mute" field, select Yes if you want to suppress Multiplan's audible alarm.
- In the "iteration" field, select Yes if you want to solve mathematical models using iterative numeric approximation methods.
- In the "test at" field, enter the absolute reference or name of the cell that contains a completion test for iteration.
- In the "A/V" field, select Yes to display the Alpha/Value command when you press Enter or a direction key.

- In the "learn" field, select Yes to have Multiplan remember which direction you are entering data as you press the direction keys; Multiplan will move the cell pointer in the same direction when you press Enter.
- In the "old menus" field, select Yes if you want to display command menus as they appeared in Multiplan 3.0. With this feature, you can run most Multiplan 3.0 macros with Multiplan 4.2.
- In the "hold alpha" field, select Yes if you want to display the Alpha command after pressing a direction key or Enter.

The proposed responses show the current settings.

After you press Enter, Multiplan's version number and the total bytes of storage currently used are displayed in the message line.

Setting the Options Fields

Multiplan saves the Options command settings except for "old menus," "iteration," and "test at" in the MP.INI file when you quit. The next time you start Multiplan, Multiplan uses these settings. For more information, see "The MP.INI File" in Appendix C, "Tips and Additional Information About Multiplan."

The "recalc" field When you want to make many entries on a large, complex worksheet, select No in the "recalc" field for a quicker response. Select Yes again when you want to see the effect of each change. The length of time Multiplan takes to recalculate a worksheet depends on how many cells are in use, how many contain formulas, and the complexity of the formulas.

The "iteration" and "test at" fields The "iteration" and "test at" fields let you make use of numeric approximation methods. You can use iteration on a wide range of problems, such as solving simultaneous equations and finding roots of equations. Chapter 12, "Iteration," contains a detailed discussion of this powerful feature.

The "A/V" field The "A/V" field is useful if you are entering data into successive cells. When you select Yes in the "A/V" field, Multiplan displays the Alpha/Value command on the command line. When Alpha/Value is displayed, the next character you type automatically determines whether Multiplan chooses the Alpha or the Value command. Multiplan chooses the Value command if you type any digit (0 through 9) or one of these characters:

```
= + - . ( "
```

If you type any other character, Multiplan chooses the Alpha command.

When you want to perform a command other than Alpha or Value, press Esc to return to the main command menu. Multiplan displays the Alpha/Value command again the next time you press Enter.

The "learn" field The "learn" field is also useful if you are entering data into successive cells. For example, if you select Yes in the "learn" field, and if you are entering columns of data, you can start at the top of a column, type the first entry, and press the Down Arrow key. If you type the second entry and press Enter, Multiplan moves the cell pointer down. You can change the direction at any time by pressing the appropriate direction key. With this feature, you can enter data quickly using the numeric keypad.

The "hold alpha" field With the "hold alpha" field, you can repeatedly enter numeric characters as text instead of values. When Yes is selected in the "hold alpha" field, Multiplan displays the Alpha command instead of the Alpha/Value command after you use a direction key to enter text into a cell (or after you press Enter if you previously pressed a direction key and if Yes is selected in the "learn" field).

For example, when Yes is selected in the "hold alpha" field, you can quickly enter a series of dates. First choose Alpha, type the first date, press a direction key to enter it, and then Multiplan moves the cell pointer and displays the Alpha command instead of the Alpha/Value command. (For example, the Alpha/Value command would interpret the date 6/7/89 as 6÷7÷89, but the Alpha command correctly interprets it as a date. For more information, see "Alpha" and "Value" in this chapter.) You can enter the remaining dates by just typing them and pressing a direction key. Press Esc to return to the main command menu. For information on using "hold alpha" to enter dates and times, see "Entering a List of Dates and Times" in Chapter 6, "Dates, Times, and Custom Formats."

You can coordinate the settings of the "hold alpha" field and the "A/V" field for more control over which command prompt Multiplan displays after you press Enter or a direction key. If Yes is selected in both the "A/V" and "hold alpha" fields, then:

- If you enter a number or a formula, Multiplan displays the Alpha/Value command after you press Enter or a direction key, so Multiplan interprets the next numeric character you type as a number.
- If you enter text, Multiplan displays (and holds) the Alpha command after you press Enter or a direction key, so Multiplan interprets the next alpha or numeric character you type as text.

Examples To turn off automatic recalculation:

```
OPTIONS recalc: Yes(No)  mute: Yes(No)  iteration: Yes(No)  test at:
A/V: Yes(No)  learn: Yes(No)  old menus: Yes(No)  hold alpha: Yes(No)
```

To turn on "A/V," "learn," and "hold alpha":

```
OPTIONS recalc:(Yes)No  mute: Yes(No)  iteration: Yes(No)  test at:
A/V:(Yes)No  learn:(Yes)No  old menus: Yes(No)  hold alpha:(Yes)No
```

See Also **Print Options** **Transfer Options**

Print

PRINT: Printer File Margins Options Heading Setup

Presents six choices for printing the active worksheet.

- Print Printer begins printing.
- Print File stores output in a file rather than sending it to the printer.
- Print Margins sets the margins and page size for the printed output.
- Print Options selects the part of the worksheet you want to print, the way the output appears, and the number of copies.
- Print Heading specifies headers, footers, and page numbers on the printed worksheet.
- Print Setup specifies the printer driver, model, and port adapter.

For information on advanced printing topics, see Appendix B, "Using PRD Files and Advanced Printing Features."

The Print subcommands are explained below.

Print File

PRINT on file:

Stores printed output in a file rather than sending it to the printer.

Choose the Print File command if, for example, you want to use a text editor to alter the file before printing it, or if you want to include the file as an illustration in another text file.

- In the "on file" field, enter the name of the file you want to create.

If a file of the same name exists, Multiplan displays the message, *Enter Y to overwrite file*. Press Y to overwrite the existing file—any other key cancels the Print File command.

The file contains the printed output just as Multiplan would send it to the printer. Any special characters for character enhancements, such as bold or strikethrough, or instructions to print a different color, and any printer information such as form feeds, also appear in the file. If you want to print to a file without any additional printer characters, use the TEXT printer driver.

WARNING Be sure to specify a filename different from that of your worksheet; otherwise, you will overwrite the worksheet.

Example To write a printable version of a worksheet to a file named BUDGET:

PRINT on file: budget.prn

The .PRN extension is a convenient way to indicate print files.

See Also **Print Heading**
Print Options
Print Printer
Print Setup
Run Report File

Print Heading

```
PRINT HEADING header:                    footer:
     begin numbering at: 1      number format: (1) I i A a
```

Tells Multiplan where to look on the worksheet for headers and footers, and how to number pages.

- In the "header" field, enter the cell reference or name of the range of cells containing your header.
- In the "footer" field, enter the cell reference or name of the range of cells containing your footer.
- In the "begin numbering at" field, enter the first page number you want to print.
- In the "number format" field, select 1 for standard Arabic numerals, I for uppercase Roman numerals, i for lowercase Roman numerals, A for uppercase alphabetic characters, or a for lowercase alphabetic characters. When you use alphabetic characters, AA follows Z, and so on through the alphabet.

When Multiplan prints the worksheet, it uses the information in the specified cells for the header on each page. You can subsequently prevent headers from printing by moving the cursor to the "header" field and pressing Del. You use the "footer" field the same way as you use the "header" field.

If you want to create a single report from several different worksheets, you can press F3 in the "begin numbering at" field. Multiplan automatically places the sum of the last page printed plus one page, in the field.

Creating Headers and Footers

The header starts on the line immediately after the top margin. The footer ends on the line immediately preceding the bottom margin. If a row in the header or footer cell reference contains more text than fits on a printed line, Multiplan truncates the text.

NOTE When you create headers and footers, you must allow enough room to print the worksheet. The number of lines you allow for the header and footer, plus the top and bottom margins, must leave room for Multiplan to print at least one inch of a worksheet on a page.

To print page numbers, you must type **&p** in the header or footer. When Multiplan prints the worksheet, it replaces these characters with the page number.

You can use the following codes in headers or footers to align text at the left, right, or center of the page:

Alignment code	Result
&L	Aligns the following characters to the left
&R	Aligns the following characters to the right
&C	Centers the following characters

If no alignment code is used, Multiplan centers the text. Multiplan ignores leading spaces when centering text, but not trailing spaces. For more information on printing headers and footers, see Chapter 3, "Printing a Worksheet."

Example To print a header from cells R50C1:4 and number the pages with lowercase Roman numerals:

```
PRINT HEADING header: R50C1:4          footer:
      begin numbering at: 1        number format: 1 I (i) A a
```

See Also **Print File** **Print Setup**
Print Options **Run Report File**
Print Printer

Print Margins

```
PRINT MARGINS top: 1"      bottom: 1"      left: 0.5"      right: 0.5"
              page size: Letter  length: 11"  width: 8.5"  measure: Ch(In)Cm
```

Alters the margins and page size for printed output.

You can set the margins and page size in characters, inches, or centimeters.

- In the "top" field, enter the size of the top margin.
- In the "bottom" field, enter the size of the bottom margin.
- In the "left" field, enter the size of the left margin.
- In the "right" field, enter the size of the right margin.
- In the "page size" field, enter the size of the page. Press a direction key to display a list of the available sizes for your printer.
- In the "length" field, enter the length of the paper. Multiplan uses this information to calculate the correct number of lines to skip before printing the next page.
- In the "width" field, enter the width of the paper.
- In the "measure" field, select the units to use for measuring the margins: Ch for Characters, In for Inches, or Cm for Centimeters. The initial default setting is determined by the country code setting in your CONFIG.SYS file.

Setting the Print Margins Fields

The proposed responses are either those created by the last Print Margins command, or the default settings.

When you set the "page size" field from the list, Multiplan automatically sets the "length" and "width" fields for you. If you change either the "length" or "width" fields so that the page size is not one of the enumerated standard sizes, then Multiplan sets the "page size" field to Custom.

The Character setting in the "measure" field is a standard 12-point character, 1/6th of an inch high and 1/10th of an inch wide. You can specify fractions of a unit, for example, 1.25 Cm. You can also override the unit of measurement by stating the unit of measurement explicitly in the other fields; for example, 1 cm, 2", or 6 ch. In all the fields except "measure," use a double quotation mark (") to indicate inches.

Multiplan prints as many columns across the page as will fit within these margins. Any columns left over are printed on a second page, with the row and column numbers continued.

The responses in the Print Margins command fields are saved with the worksheet.

After you press Enter in the Print Margins command, the Print command appears instead of the main command menu.

NOTE If you set a page length different from the one your printer is set for, your printer may skip to the next page at the wrong time. If this happens and if you know that you set the "length" field correctly, then experiment with your printer's settings to skip the correct number of lines.

Example A sheet of letter-size paper is 8.5" x 11". Assuming the printer prints 10 characters per inch across a page and 6 lines per inch down a page, the page length is 66 characters and the page width is 85 characters. To fill these dimensions, you might want a top margin of 3 characters and a print length of 60 characters, for a bottom margin of 3 characters. A print width of 65 characters leaves 20 characters total for the right and left margins. To center lines on the page, you need a left margin of 10 characters. Your response would be:

```
PRINT MARGINS top: 3          bottom: 3          left: 10          right: 10
              page size: custom  length: 66  width: 85  measure: (Ch)In Cm
```

See Also **Print File**
Print Options
Print Printer
Print Setup
Run Report File
Run Report Print Cross-Ref

Print Options

```
PRINT OPTIONS area: R1:4095        draft: Yes(No)  formulas: Yes(No)
              r/c numbers: Yes(No)  # of copies: 1
```

Sets five optional features before printing:

- In the "area" field, enter the cell reference or name of the range of cells you want to print. The proposed response, R1:4095, is the entire worksheet.
- In the "draft" field, select Yes if you want to print in draft mode. In draft mode, Multiplan prints without adding character enhancements to the text.
- In the "formulas" field, select Yes if you want to print formulas rather than the values that the formulas generate. Column widths are doubled when this field is set to Yes.
- In the "r/c numbers" field, select Yes if you want to include row and column numbers on your printed copy.
- In the "# of copies" field, enter the number of copies you want to print. Multiplan always prints the number of copies you specify, even if your printer doesn't have a built-in command for multiple copies.

Example To print five copies of an area named "Factors" in draft mode:

```
PRINT OPTIONS area: Factors        draft:(Yes)No    formulas: Yes(No)
               r/c numbers: Yes(No)  # of copies: 5
```

See Also

Print File
Print Margins
Print Printer
Print Setup
Run Report File
Run Report Print Cross-Ref

Print Printer

PRINT on printer:

Starts printing the worksheet under the conditions set up by the Print Margins and Print Options commands.

The time it takes to print depends on the size of the worksheet you are printing, the number of styles, and the speed of the printer.

Multiplan does not print empty columns at the right of the worksheet or empty rows at the bottom of the worksheet. Multiplan prints as many rows and columns as will fit on the page. If there are rows still to be printed, it prints a second page, repeating the same columns. When all the rows have been printed, Multiplan starts the next set of columns on a new page. If the area to be printed is wider than the paper, you can assemble the worksheet to its complete width by cutting and pasting.

Press Esc to stop printing.

If a printer error occurs during printing, Multiplan displays the message, *Printer error*.

See Also

Print File
Print Margins
Print Options
Print Setup
Run Report File
Run Report Print Cross-Ref

Print Setup

PRINT SETUP printer: TEXT model:
adapter: PRN

Sets the printer driver, model, and port adapter of the printer you are using.

- In the "printer" field, enter the printer driver file (*.PRD) corresponding to your printer. Press a direction key to select from a list of the available printer drivers. Multiplan displays the printer drivers in the program directory unless you enter a different directory path. If Multiplan does not have a special PRD file for your printer, you can specify the generic TEXT printer driver which is built into Multiplan.
- In the "model" field, enter your printer model by pressing a direction key to select from a list of available models; the list is based on the printer driver file. Not all printer drivers feature multiple models, but being able to select among several models means that one driver can handle many printer configurations.
- In the "adapter" field, enter the device name of the printer you want to print the worksheet on, such as COM1 or PRN. If you have several printers on different ports, use this field to print to a specific port. The default port is PRN which is usually equivalent to LPT1, but PRN may be changed to refer to another port.

For more information on printer drivers, models, and adapters, see Appendix B, "Using PRD Files and Advanced Printing Features" and the PRINTERS.DOC file on the Utilities disk. For more information on how to change PRN, see your DOS or OS/2 manual.

NOTE When you select the TEXT printer driver, the "model" field remains blank. TEXT, unlike other printer drivers, is built into Multiplan. Other "models" are available only if the printer drivers are installed and support multiple models.

The SETUP program on the Multiplan Setup disk copies printer drivers to your Multiplan program directory. You can install additional printer drivers by running the SETUP program or by copying the printer driver from the appropriate Multiplan disk with the DOS or OS/2 Copy command.

See Also **Print File**
Print Margins
Print Options
Run Report File
Run Report Print Cross-Ref

Quit

QUIT:

Exits Multiplan.

If you have made changes to your worksheet since the last time you saved it, you will see this message: *Enter Y to save edits, N to lose edits, or cancel.*

If you press Y, Multiplan saves the entire worksheet under the filename and mode you last specified with the Transfer Load or Transfer Save command, or with the name TEMP if you haven't specified a filename, and returns you to the system prompt. (If there is already a file with the same name, Multiplan asks you if you want to overwrite the file.) If you press N, Multiplan quits without saving your work. Press Esc to cancel the command and return to the command menu.

Every time you quit, Multiplan saves certain setup information in a file called MP.INI. For more information, see "The MP.INI File" in Appendix C, "Tips and Additional Information About Multiplan."

See Also **Transfer Save**

Run

RUN: Command Audit Report Database

Presents a choice of four actions:

- Run Command runs DOS and OS/2 commands from within Multiplan.
- Run Audit examines the relationships between formulas and cells in the worksheet.
- Run Report provides reports on worksheet information.
- Run Database finds, extracts, and deletes database information.

The Run subcommands are explained on the following pages.

Run Audit

RUN AUDIT: Formulas Cells

Presents a choice of two kinds of auditing.

- Run Audit Formulas examines the cells used by a formula.
- Run Audit Cells examines the cells referring to a specified cell.

For information on auditing worksheets, see Chapter 10, "Auditing a Worksheet.

The Run Audit subcommands are explained below.

Run Audit Cells

RUN AUDIT CELLS cell: R1C1

Examines the cells referring to a cell.

- In the "cell" field, enter the name or reference of a single cell that you want to audit; you cannot select a range.

After you press Enter, the Run Audit Cells windows appear.

The upper window displays information about the cell you are auditing. A list of all the cells that refer to this cell appears, starting on the second line of the upper window. If there are more cell references than can be displayed at one time in the upper window, you can press PgUp and PgDn to view the rest of the list of cells.

The last two lines in the upper window show general information about the cell. "Value" shows the actual value of the cell and "Displayed Value" shows what appears on the worksheet. "Format" shows the cell format.

The lower window displays information about the cell that is highlighted in the upper window. The first line in the lower window identifies the cell being examined. The next line shows the formula, value, or contents of the cell. The information that appears here is the same information that appears in the status line after the cell reference. The last two lines of the lower window refer to the cell in the first line of the lower window.

You can continue auditing cells by pressing the Up Arrow key. The upper window now displays cells that refer to this cell, as it did with the previous cell.

The response in the "cell" field keeps track of the path you are auditing.

You can return to a previous cell by pressing the Down Arrow key. The cell information in the upper window moves to the lower window, and the information for the previous cell appears in the upper window.

If you audit a path that ends in a circular reference, Multiplan sounds a tone and displays the error message, *Circular reference, original cell reached.*

To stop auditing, press Esc.

For more information on auditing cells and formulas, see Chapter 10, "Auditing a Worksheet."

Example To audit cell R15C4:

RUN AUDIT CELLS cell: R15C4

See Also **Run Audit Formulas**

Run Audit Formulas

RUN AUDIT FORMULAS cell: R1C1

Examines the cells referred to by a formula.

- In the "cell" field, enter the name or reference of a single cell containing a formula; you cannot select a range.

After you press Enter, the Run Audit Formulas windows appear.

The upper window displays information about the cell you are auditing. The lower window displays information about the cell reference or name that is highlighted in the formula in the upper window. You press the Right Arrow and Left Arrow keys to highlight cell references in the formula in the upper window. If there is no formula in the cell in the upper window, the lower window is blank.

The first line in each window identifies the cell. The next line shows the contents of the cell. The information that appears here is the same information that appears in the status line after the cell reference. "Value" shows the actual value of the cell and "Displayed Value" shows what appears on the worksheet. "Format" shows the cell format.

If the lower window contains information about a formula, then you can audit further by pressing the Down Arrow key. This moves the information in the lower window to the upper window. You can now examine the cells that make up this formula as you did with the previous cell.

The response in the "cell" field keeps track of the path you are auditing.

You can return to a previous formula by pressing the Up Arrow key. The information in the upper window moves to the lower window, and the cell information associated with the previous formula appears in the upper window.

You can press the Right Arrow and Left Arrow keys to examine cells in a range. The standard order for displaying cells in a range is to show all the columns in a row, and then to continue with the next row. If the highlighted cell reference in the upper window is a name, the cells in the name are listed on the last line of the upper window.

If you audit a path that ends in a circular reference, Multiplan sounds a tone and displays the error message, *Circular reference, original cell reached.*

To stop auditing, Press Esc.

For more information on auditing formulas and cells, see Chapter 10, "Auditing a Worksheet."

Example To audit the formula in cell R12C19:

RUN AUDIT FORMULAS cell: R12C19

See Also **Run Audit Cells**

Run Command

RUN COMMAND:

Performs a DOS or OS/2 command or opens an operating system shell from within Multiplan. (This command is Run DOS in Multiplan version 3.0.)

Type the command on the command line and press Enter. Multiplan clears the screen and performs the command. Any information normally displayed by the command appears on the screen. When the command has finished, press any key to resume Multiplan.

If you want to perform several commands, type **command** if you are using DOS, or type **cmd** if you are using OS/2, and press Enter. The DOS or OS/2 prompt appears. You can perform as many commands as you like. When you are ready to resume Multiplan, type **exit** and press Enter.

WARNING If you are running Multiplan under DOS and you run a program with Run Command that stays resident in memory, Multiplan displays an error message, ends, and returns to the DOS prompt. Any information you have entered on the active worksheet is lost unless you have previously saved it. If you are running Multiplan under OS/2, you can run any OS/2 program with Run Command.

Example To copy the SPENCER worksheet in the MP directory to SPENCER.SAV on drive A:

RUN COMMAND: copy spencer a:spencer.sav

Run Database

RUN DATABASE: Forward-search Backward-search Extract Delete

Presents a choice of four actions related to using a database on the worksheet:

- Run Database Forward-search searches forward (down) through a database.
- Run Database Backward-search searches backward (up) through a database.
- Run Database Extract finds information in a database and copies it to an extract range.
- Run Database Delete deletes records in a database.

The Run Database subcommands are explained below.

Run Database Backward-search
Run Database Forward-search

RUN DATABASE SEARCH

Finds records in the database that match the the criteria in the criteria range.

Run Database Backward-search searches up through the records (rows) in the database. Run Database Forward-search searches down through the records in the database.

If the active cell is outside the database when you choose the Run Database Backward-search command, Multiplan finds the first record from the bottom of the database that matches the criteria. Similarly, Multiplan finds the first record from the top of the database when you choose the Run Database Forward-search command. When a matching record is found, the cell pointer moves to the first field of the matching record.

If the active cell is inside the database when you choose the Run Database Backward-search command, Multiplan finds the first record above the active cell that matches the criteria. Similarly, Multiplan finds the first record below the active cell when you choose the Run Database Forward-search command. When a matching record is found, the cell pointer moves to the row containing the record but remains in the same column.

If no record matches the criteria in the direction of the search, Multiplan displays the message, *Not found.*

Once you have found a record in the database, you can search forward or backward by pressing the direction keys.

Press	To find
Down Arrow	The next matching record (below)
Up Arrow	The previous matching record (above)
PgDn	The first matching record at least one screen down from the selection
PgUp	The last matching record at least one screen up from the selection

To return to the main command menu, press Esc, and then press Enter.

If there are no matching records in the direction you choose, the cursor does not move and Multiplan displays the message, *Not found.*

For information on how to create and use a database, see Chapter 11, "Database."

See Also **Run Database Delete** **Run Database Extract**

Run Database Delete

RUN DATABASE DELETE:

Deletes records from a database that match criteria in the criteria range.

WARNING This command deletes records permanently. If you are not sure that the Run Database Delete command will delete the right records, save your worksheet before choosing this command. You can see what records will be deleted before actually deleting them by first creating your criteria, and then extracting the records using the Run Database Extract command or finding records with the Run Database Forward-search and Run Database Backward-search commands.

After you choose the Run Database Delete command, Multiplan displays this message: *Enter Y to confirm each deletion, N to delete all, or press Esc to cancel.*

If you press N, Multiplan deletes all records that match the criteria. If you press Esc, Multiplan returns to the command menu.

If you press Y, Multiplan searches from the first record in the database. When it finds a record that matches the criteria, Multiplan displays this message: *Enter Y to delete, N to skip, or press Esc to cancel.*

If you press Y, Multiplan deletes the record. If you press N, Multiplan skips this record and searches for the next matching record. If you press Esc, Multiplan returns to the main command menu.

When you delete a record from the database, Multiplan shifts the rest of the database up to fill the gap, but the rest of the worksheet is unaffected. Multiplan continues until there are no more records that match the criteria or until you press Esc.

When you return to the command menu, Multiplan displays the number of records deleted from the database.

For information on how to create and use a database, see Chapter 11, "Database."

See Also **Run Database Backward-search** **Run Database Forward-search** **Run Database Extract**

Run Database Extract

RUN DATABASE EXTRACT to cells: R1C1

Finds database records that match criteria in the criteria range and copies them to an extract range.

- In the "to cells" field, enter the extract range.

Before you choose this command, you must correctly define the database and criteria ranges. For more information, see Chapter 11, "Database."

If you select an extract range that is more than one row high, Multiplan extracts only as many records as will fit in that range. If there are more records than will fit, Multiplan displays the message, *Extract range filled.*

WARNING You should not set up an extract range around data you intend to keep. When you choose Run Database Extract, Multiplan clears the entire extract range before it copies the records that match the criteria into the range. If you select only the cells containing the field names as your extract range, the extract range extends from below the field names to as many rows as are in the database. In that case, when you choose Run Database Extract, Multiplan clears enough rows to extract every record in the database, if necessary, plus one blank row to indicate where the extraction ended.

If you include a blank row in the criteria range, then when you search for or extract records, Multiplan finds or extracts every record in the database.

If Multiplan encounters a locked cell in the extract range, it displays the error message, *Locked cell cannot be changed.* In this situation, change or unlock the extract range.

For information on how to create and use a database and how to extract specific fields within records, see Chapter 11, "Database."

Example To extract records to the area R15C20:R20C24 on worksheet 2:

```
RUN DATABASE EXTRACT to cells: 2:R15C20:R20C24
```

See Also **Run Database Backward-search** **Run Database Forward-search** **Run Database Delete**

Run Database Forward-search

See Run Database Backward-search.

Run Report

```
RUN REPORT: Print File
```

Presents a choice of two actions related to printing reports from worksheet information.

- Run Report Print begins printing.
- Run Report File stores printable output in a file.

The Run Report subcommands are explained below.

Run Report File

```
RUN REPORT FILE: Cross-Ref Names Summary
```

Presents a choice of three reports to store in a file.

- Run Report File Cross-Ref reports on all the cells that refer to another cell.
- Run Report File Names lists the names defined in a worksheet.
- Run Report File Summary reports on various worksheet statistics.

The Run Report File subcommands are explained on the following pages.

Run Report File Cross-Ref

```
RUN REPORT FILE CROSS-REF file: C:\MP\TEMP.XRF      cell: R1:4095
references:(Yes)No  value:(Yes)No  format:(Yes)No  levels:  indent: 0.4"
```

Stores a printable report of all the cells that refer to another cell. Only cells that contain formulas, text, or constants are included in this report.

- In the "file" field, enter a valid filename for the report.
- In the "cell" field, enter the cell or range of cells you want to examine. If you do not enter cell references, Multiplan reports on the entire worksheet.
- In the "references" field, select Yes, if, for every cell containing a formula, you want to print a list of the cells that are used in that formula.
- In the "value" field, select Yes if you want to print the value of the cell.
- In the "format" field, select Yes if you want to print the format of the cell.
- In the "levels" field, enter the number of indented levels that you want to include in the report.
- In the "indent" field, enter the number of inches, centimeters, or characters that you want to indent at each level. If you enter a number without units (", cm, or ch), Multiplan uses the units specified in the "measure" field of the Print Margins command.

In the report, Multiplan lists the cells in the order in which they appear in a formula. If you have more levels of indentation than you can print, Multiplan returns the indentation to the left margin and places an asterisk in front of the reference.

A cell used in a formula is a **supporting cell**. When Yes is selected in the "references" field, if a supporting cell uses other cells in its formula, then those cells are indented below the supporting cell. Named references used in formulas appear on the report with a list of their component cells appearing below the name.

Multiplan continues to show levels of dependent cells until it has displayed the number of levels set in the "levels" field. If you did not set a maximum number of levels, Multiplan shows all levels of dependent cells. Multiplan also stops listing levels of cells if it encounters a circular reference. The second time that a cell appears in a chain, Multiplan precedes the cell with the message **CIRC**.

The currently-defined report header and footer are also stored in the file and they appear on each page of the report.

Example To report on the entire worksheet with references, values, formats, and two levels of indentation, and to send the report to the file TEMP.XRF:

```
RUN REPORT FILE CROSS-REF file: C:\MP\TEMP.XRF      cell: R1:4095
 references:(Yes)No  value:(Yes)No  format:(Yes)No  levels: 2  indent: 0.4"
```

See Also **Print Heading** **Run Audit Cells**
Print Setup

Run Report File Names

```
RUN REPORT FILE NAMES file: C:\TEMP.NAM    report:(All)Names Macros
```

Stores a printable report of all the named cells, named cell ranges, or macro names in a worksheet.

- In the "file" field, enter a valid filename.
- In the "report" field, select All to show all names in the worksheet, select Names to show only named areas that are not macros, or select Macros to show only macro names.

Multiplan prints two lines for each name. The first item on the first line is the name itself. If the name refers to a macro, Multiplan displays "Yes" after "Macro"; otherwise, Multiplan displays "No." Macros must be identified as macros with the Name command for Multiplan to identify them as macros on this report. If there is a command key sequence assigned to this name, the sequence appears after "Command Code." If no command key sequence is assigned to the name, "NONE" is displayed after "Command Code." The second line contains either cell references (if the name refers to a named cell range) or a set of macro commands (if the name refers to a macro).

The currently defined report header and footer are also stored and appear on each page of the report.

Example To report on the named areas in the worksheet that are not macros and to store the report in the file A:NAMEFILE:

```
RUN REPORT FILE NAMES file: A:NAMEFILE      report: All(Names)Macros
```

See Also **Print Heading** **Run Audit Cells**
Print Setup

Run Report File Summary

RUN REPORT FILE SUMMARY file: C:\TEMP.SUM report:(Count)Full

Stores a printable report on conditions in a worksheet that are likely to cause errors.

- In the "file" field, enter a valid filename.
- In the "report" field, select Count if you want a simple count of the error conditions, or select Full if you want a full list of the cells associated with each error condition.

Multiplan also stores the currently defined report header and footer and prints them on each page of the report.

Here is a list of the possible error conditions identified in the summary report, and what they mean:

Possible error conditions	What they may mean
Formulas that reference blank cells	The formulas may need a value from the blank cells. This can cause #VALUE! or #N/A errors.
Cells with formats but no value	The cells were formatted for a specific type of information, but the information is not entered. Unused formatted cells can take up memory space you may need elsewhere.
Named areas that overlap	Two areas each refer to the same cell.
Names with redundant references	A name has a cell or cells specified more than once; for example, a named area R1C1,R2C2,R1C1:R2C2.
Named areas that are partially locked	An area has been locked to protect data. A named area is partially covered by the lock, but some of the named area is not protected.
Cells with circular references	A cell contains a circular reference.

The summary report may also identify cells with a value of error. This group of messages identifies cells containing the following errors:

Error	Cause
#DIV/0!	Attempting to divide by zero
#N/A	A value that is not available
#NAME?	An undefined label reference
#NULL!	Specifying an intersection of nonintersecting areas, for example, R1 R2
#NUM!	Number is too large or too small, or an illegal use of an arithmetic function; for example, SQRT(–1)
#REF!	A relative reference reaching outside the worksheet, or a reference to a deleted area
#VALUE!	Using text where a number is needed or vice versa, or using references when a value is needed

IMPORTANT This report only identifies the unusual conditions that are most likely to lead to errors. You must determine for yourself if these conditions will cause problems for you.

Example To report on conditions and the associated cells, and to store the report in the file SUMMARY.RPT:

```
RUN REPORT FILE SUMMARY file: SUMMARY.RPT      report: Count(Full)
```

See Also **Print Heading** **Run Audit Cells**
Print Setup

Run Report Print

```
RUN REPORT PRINT: Cross-ref Names Summary
```

Presents a choice of three reports to print.

- Run Report Print Cross-ref reports on all the cells that refer to another cell.
- Run Report Print Names lists the names defined in a worksheet.
- Run Report Print Summary reports on various worksheet statistics.

The Run Report Print subcommands are explained on the following pages.

Run Report Print Cross-Ref

```
RUN REPORT PRINT CROSS-REF cell: R1:4095  references:(Yes)No
    value:(Yes)No        format:(Yes)No  levels:       indent: 0.4"
```

Prints a report of all the cells that refer to another cell. Only cells that contain formulas are included in this report.

This command is identical in operation to Run Report File Cross-Ref except that you do not need to specify a file in which to store the printable output.

Example To report on the entire worksheet with references, values, formats, and two levels of indentation:

```
RUN REPORT PRINT CROSS-REF cell: R1:4095    references:(Yes)No
        value:(Yes)No    format:(Yes)No  levels: 2    indent: 0.4"
```

See Also **Print Heading** **Run Audit Cells**
Print Setup

Run Report Print Names

```
RUN REPORT PRINT NAMES: All Names Macros
```

Prints a report of all the names in a worksheet.

This command is identical in operation to Run Report File Names except that you do not need to specify a file in which to store the printable output.

Example To report on the named areas in the worksheet that are not macros:

```
RUN REPORT PRINT NAMES: All(Names)Macros
```

See Also **Print Heading** **Run Audit Cells**
Print Setup

Run Report Print Summary

```
RUN REPORT PRINT SUMMARY: Counts Full
```

Prints a report on conditions in a worksheet likely to cause errors.

This command is identical in operation to Run Report File Names except that you do not need to specify a file in which to store the printable output.

Example To report on conditions and the associated cells:

RUN REPORT PRINT SUMMARY: Counts(Full)

See Also **Print Heading** **Run Audit Cells**
Print Setup

Sort

SORT: Rows Columns

Presents two ways to sort a worksheet.

- Sort Columns sorts columns.
- Sort Rows sorts rows.

For example, columns titled Name, Address, and Phone No. might be sorted alphabetically as Address, Name, and Phone No. Or rows titled Thompson, Smith, and Adams might be sorted alphabetically as Adams, Smith, and Thompson.

The Sort subcommands are explained below.

Sort Columns

SORT COLUMNS by row: 1 between columns: 1 and: 255 order:(>) <

Reorders the columns on the worksheet using the selected row or rows as the sort key.

- In the "by row" field, enter the row or rows you want to use as sort keys. Type the row number, not reference (for example, type **1**, not **r1**). Specify multiple keys by entering a list of rows separated by commas. Each selected row is treated as a separate sort key, with the first row having the highest priority (the **primary sort key**). The proposed response is the active row.
- In the "between columns" and "and" fields, enter the range of columns you want to sort. Use column numbers, not reference numbers (for example, type **1**, not **c1**). The proposed response for these fields is the entire worksheet.
- In the "order" field, select > to sort in ascending order, or < to sort in descending order. The proposed response is ascending order, from least to greatest.

The columns to be sorted can contain numbers, text, or other values. When you sort, Multiplan first groups different types and then sorts them in this order:

- Numbers
- Text
- Logical and error values
- Blank cells

Multiplan further sorts numbers and text into either ascending (>) or descending (<) order. Text is arranged according to the ASCII standard character sequence, that is, from "least" to "greatest":

! # $ % & ' ( ) * + , - . / 0–9 : ; > = < ? @ a–z [\ ] ^ _ ` { | } ~

Within each value type, equal values are left in the order in which Multiplan encounters them.

Because sorting may move cells that some formulas use to calculate values, you might change your worksheet in ways you don't want to. To generate a sorted report without changing the values generated by formulas, turn off automatic recalculation. Multiplan then displays the values calculated before the sort was performed. You can print this sorted worksheet, but do not save it.

Notice that numbers mixed with text in a cell, or dates represented as text, are sorted as text; for example, Multiplan sorts "A10" as less than "A9."

When you sort dates and times, they appear in chronological order.

For information on how Multiplan adjusts references when you sort, see "Changing the Worksheet" in Appendix C, "Tips and Additional Information About Multiplan."

Examples To sort a group of column headings in alphabetic order:

SORT COLUMNS by row: 5 between columns: 3 and: 15 order:(>) <

See Also **Move Column** **Sort Rows**

Sort Rows

```
SORT ROWS by column: 1    between rows: 1    and: 4095    order:( > ) <
```

Reorders the rows on the worksheet using the selected column or columns as the sort key.

- In the "by column" field, enter the number of the column or columns you want to use as sort keys. Type the column number, not reference (for example, type **1**, not **c1**). Specify multiple keys by entering a list of columns separated by commas. Each selected column is treated as a separate sort key, with the first column having the highest priority (the primary sort key). The proposed response is the active column.
- In the "between rows" and "and" fields, enter the range of rows you want to sort. Use row numbers, not reference numbers (for example, type **1**, not **r1**). The proposed response for these fields is the entire worksheet.
- In the "order" field, select > to sort in ascending order, or < to sort in descending order. The proposed response is ascending order, from least to greatest.

The rows to be sorted may contain numbers, text, or other values. When you sort, Multiplan first groups different types and then sorts them in this order:

- Numbers
- Text
- Logical and error values
- Blank cells

Multiplan further sorts numbers and text into either ascending (>) or descending (<) order. Text is arranged according to the ASCII standard character sequence, that is, from "least" to "greatest":

```
! # $ % & ' ( ) * + , - . / 0–9 : ; > = < ? @ a–z [ \ ] ^ _ ` { | } ~
```

Within each value type, equal values are left in the order in which Multiplan encounters them.

To generate a sorted report without the effects of the adjusted formulas, turn off automatic recalculation. Multiplan then displays the values calculated before the sort was performed. You can print this sorted worksheet, but do not save it.

Numbers mixed with text in a cell, or dates represented as text, are sorted as text; for example, Multiplan sorts "A10" as less than "A9."

When you sort dates and times, they appear in chronological order.

For information on how Multiplan adjusts references when you sort, see "Changing the Worksheet" in Appendix C, "Tips and Additional Information About Multiplan."

Examples To sort a list of checks into categories (in column 1) by amount (in column 2) with the largest amount at the top of each category:

SORT ROWS by column: 1,2 between rows: 1 and: 4095 order: > (<)

See Also **Move Row** **Sort Columns**

Transfer

TRANSFER: Load Save Clear Delete Options Rename

Offers a choice of six subcommands that affect an entire worksheet.

- Transfer Load loads a saved worksheet.
- Transfer Save saves the active worksheet in a file.
- Transfer Clear clears either the active worksheet, deleting all its contents, or all the worksheets on the screen.
- Transfer Delete deletes a file and updates external links.
- Transfer Options specifies which disk drive and path and which file format to use.
- Transfer Rename saves the active worksheet under a new name and updates external links.

The Transfer subcommands are explained below.

See Also **External Copy**

Transfer Clear

TRANSFER CLEAR: All Window

Clears the entire worksheet or the active window.

- Transfer Clear All clears all windows and worksheets.
- Transfer Clear Window clears the active window of all worksheet information, but leaves any other windows on the worksheet unaffected.

The Transfer Clear subcommands are explained on the following pages.

Transfer Clear All

TRANSFER CLEAR ALL:

Clears all windows and worksheets.

The Transfer Clear All command closes all windows, clears all cells, sets all columns to the default width, sets the default alignment and format to General, clears all custom formats, clears all names and all links to external worksheets, and sets the worksheet name to TEMP.

If a copy of the active worksheet has previously been saved with the Transfer Save command, that copy is not affected when you choose the Transfer Clear All command.

If you have entered any information on the worksheet and have not saved it, Multiplan asks you if you want to save it. Press Y to save it, N to lose the information, or Esc to cancel the command and return to the main command menu. If you have multiple worksheets loaded, Multiplan moves the cell pointer to each worksheet that you have changed and not saved, and then asks you if you want to save it.

See Also **Blank** **Transfer Clear Window**
Delete **Transfer Save**

Transfer Clear Window

TRANSFER CLEAR WINDOW:

Clears the active window of all worksheet information, but leaves any other windows on the worksheet unaffected.

If you have entered any information on the worksheet but have not saved it, Multiplan asks you if you want to save it before the window is cleared. Press Y to save it, N to lose the information, or Esc to cancel the command and return to the main command menu.

NOTE Saving your worksheet in this way saves custom formats to the worksheet, but does not save them to the MP.INI file. If you want to save custom formats so that they can be used by other worksheets, you must load the worksheet containing the custom formats and then quit Multiplan.

When Multiplan clears a window, it normally sets the worksheet's name to TEMP. If a window already contains a worksheet with this name, Multiplan uses TEMP1 as the default name. If any two worksheets in other windows are already using the names TEMP and TEMP1, Multiplan uses the name TEMP2, and so on, up to TEMP7.

See Also **Blank** **Transfer Clear All**
Delete **Transfer Save**

Transfer Delete

TRANSFER DELETE filename:

Deletes a file from the default drive and adjusts external links to supporting worksheets.

- In the "filename" field, enter the name of the file you want to delete.

IMPORTANT This command is not the same as the DOS or OS/2 Erase command. If you use the Erase command to delete a worksheet, it does not change the external links to other worksheets.

Press a direction key to display a list of files, subdirectories, and drives. The subdirectories and drives are enclosed in square brackets. Move the cursor to the filename you want to delete or to the subdirectory or drive you want to search next, and then press Enter. To move up one level in the directory structure, move the cursor to [. .] and press Enter.

When you press Enter, Multiplan displays the message, *Enter Y to confirm*. Press Y to delete the file. Pressing any other key cancels the Transfer Delete command.

WARNING The Transfer Delete command deletes files permanently. Be sure to specify the correct file on the correct drive and have adequate backups.

Example To delete a file named BUDGETD in the directory MP on a disk in drive A:

TRANSFER DELETE filename: A:\MP\BUDGETD

See Also **Blank** **Transfer Clear**
Delete **Transfer Load**

Transfer Load

Loads a worksheet or imports ASCII information from a file.

With a mode other than ASCII selected in the Transfer Options command:

```
TRANSFER LOAD filename:                    read only: Yes(No)
```

The following fields appear when an option other than ASCII is selected in the "mode" field of the Transfer Options command.

- In the "filename" field, enter the name of the worksheet you want to load.
- In the "read only" field, select Yes if you want to load and view, but not change, the worksheet.

With the ASCII mode selected in the Transfer Options command:

```
TRANSFER LOAD filename:                              at: R1C1
     numbers:(Yes)No     query:(Yes)No          delimiters: ^s,^t
```

The following fields appear when ASCII is selected in the "mode" field of the Transfer Options command.

- In the "at" field, enter the cell reference on the active worksheet where you want to import data from an ASCII file.
- In the "numbers" field, select Yes if you want to import ASCII numeric characters as numbers, not as text.
- In the "query" field, select Yes if you want Multiplan to prompt you before it overwrites cells as it imports ASCII data.
- In the "delimiters" field, enter the list of characters you want to use to delimit (or separate) incoming ASCII data. Space (^s) and tab (^t) characters are the default delimiters.

Loading a Worksheet

Multiplan automatically loads files created by Multiplan (versions 2.0 and higher), Microsoft Excel, Lotus 1-2-3, Symphony, and files written in the Symbolic Link (SYLK) format. To load ASCII files, see "Loading ASCII Files" later in this section. To convert worksheets from an earlier version of Multiplan, see "Using Worksheets from Previous Versions of Multiplan" in the "Getting Started" chapter and "Converting Worksheets from Previous Versions of Multiplan" in Appendix C, "Tips and Additional Information About Multiplan."

When you load a new worksheet, Multiplan first prompts you to save any changes you have made to the active worksheet. Press Y to save the active worksheet and load the new worksheet, N to load the new worksheet without saving your changes, or Esc to cancel the Transfer Load command.

WARNING When Multiplan reads an ASCII file, it does not clear the worksheet first; instead, it replaces information on the active worksheet cell by cell, starting at the cell specified in the "at" field of the Transfer Load command. Similarly, when Multiplan reads a SYLK file, it replaces information cell by cell wherever the information was when it was saved to the SYLK file.

Microsoft Excel supports names up to 200 characters long, but Multiplan supports only 31 characters. When you load a worksheet created by Excel, Multiplan truncates any long names to 31 characters. This can cause errors or incorrect answers in formulas if two or more names have the same first 31 characters.

In the "filename" field, you must type the filename exactly as it was when the worksheet was saved with the Transfer Save command, or press a direction key to display a list of drives, subdirectories, and files. The subdirectories and drives are enclosed in square brackets.

Selecting a File from the Online List

To select a filename from the list, press a direction key in the "filename" field, move the cursor to the file you want to load or to the subdirectory or drive you want to search next, and then press Enter. Multiplan puts an asterisk by the names of any worksheets that are already loaded. To move up one level in the directory structure, move the cursor to [. .] and press Enter. Pressing a key other than a direction key or the Enter key causes the Multiplan screen to reappear.

If you leave the "filename" field blank before displaying the list, all files in the list are displayed. If you type characters in the "filename" field and then press a direction key to display the list, Multiplan uses those characters as a pattern and

displays only the filenames on the default drive that match the pattern. You may use the asterisk (*) and the question mark (?) as wildcard characters as explained in your DOS or OS/2 manual. For example:

If the "filename" field contains	When you press a direction key, Multiplan displays
Nothing	All files in the current directory
One name (for example, SPENCER)	Only that file in the current directory, if it exists
A directory path (for example, \SALES\ )	All files in that directory
A series of characters followed by an asterisk (for example, SP*)	All files starting with those characters, in the current directory

Using Passwords

If a worksheet was saved with a password, you must know that password to load the worksheet.

If parts of the worksheet are named "PUBLIC," you can use the External Copy command on the "PUBLIC" areas even if you don't know the password. This feature works only if the worksheet was saved by Multiplan in Normal or Excel format.

Choosing Read-Only Access

If you select Yes in the "read only" field, Multiplan opens the worksheet for viewing only. There are two reasons for loading a worksheet as read-only:

- To prevent yourself from accidentally changing the worksheet.
- To let someone else on the network or another application running under OS/2 write to the worksheet while you are viewing it.

When running multiple sessions of Multiplan under OS/2 or on a network, only the first session to load a worksheet has both read and write access to that worksheet. The other sessions under OS/2 or other users on the network can read the worksheet, but they cannot change it. Only one Multiplan session can have write access to the same worksheet at a time. If you want to load a worksheet but do not want to change it, then you can set the "read only" field to Yes so that another session of Multiplan can load the worksheet and write to it.

With read-only access, you cannot change the existing worksheet file, although you can save it to a file with a different filename and then change the new file. For more information, see Appendix A, "Using Multiplan on a Network."

Loading ASCII Files

To load an ASCII file, you must select ASCII in the "mode" field of the Transfer Options command.

The "at" field In the "at" field of the Transfer Load command, enter the starting location on the active worksheet to which you want to import data from an ASCII file. If you start importing data to a cell that is near the right or bottom edge of the worksheet (near row 4095 or column 255), Multiplan may not be able to fit all the data into the worksheet. Multiplan ignores any data that does not fit.

If you enter a single cell in the "at" field, Multiplan uses this cell as the upper-left corner of the range to transfer to. If you enter a range in the "at" field, Multiplan transfers as much information as will fit into the range. If you enter a list of cells, Multiplan uses the first item in the list as the starting point, and fills all the cells in the list with information from the corresponding positions in the ASCII file.

You can cancel the import process at any time by pressing Esc. Any data imported up to that point remains on the worksheet.

The "numbers" field The "numbers" field tells Multiplan how to interpret data from the ASCII file. If you want to enter everything as text, select No. Multiplan then enters all information as text, including dates and numbers. When Yes is selected in this field, Multiplan:

- Enters all numeric data as values rather than text.
- Interprets dates and times (must be in a standard date/time format).
- Adjusts for currency separators, percents, or scientific notation.

Multiplan does not evaluate expressions during the import process. If the ASCII file has a field containing 1+1, Multiplan enters it in a cell as the text "1+1," not as the value 2.

Any amounts in the default currency format are treated as numeric amounts; all other amounts are treated as text.

Numbers specified as percents in the ASCII file appear as percents. For example, if the number in the ASCII file is 2%, Multiplan interprets this as .02, and displays 2% in the cell.

Numbers specified in scientific notation appear as "E" numbers. For example, if the number in the ASCII file is 1E5, Multiplan interprets this as 100,000 and displays 1E+5 in the cell.

Multiplan interprets everything else as text.

The "query" field The "query" field tells Multiplan how to treat existing data. If you want Multiplan to ask before overwriting a cell, select Yes. In query mode, Multiplan highlights the cell before overwriting it and displays a message, followed by the cell reference. (If the cell being overwritten has a width of zero, Multiplan does not highlight the cell when displaying the message.)

Multiplan does not overwrite locked cells under any circumstances.

The "delimiters" field The "delimiters" field tells Multiplan the character or list of characters that separate data in the ASCII file. Tab and space characters are the default delimiters. You can specify any displayable character as a delimiter except the caret (^).

NOTE Many print files use spaces to form margins, so even if ^s is the delimiter, Multiplan ignores initial spaces on each line within ASCII files.

If you type a list of several delimiters, separate them by commas (or by semicolons if you've chosen the comma as a decimal separator). If you want to specify tab or space in a list of delimiters, type **^t** for a tab or **^s** for a space. To specify a comma, type the comma itself; for example, to specify a space, a comma, and a tab, type **^s,,,^t**

Multiplan puts each delimited field of data in a cell, starting at the leftmost cell in the range and then moves from left to right. If there are no recognizable delimiter characters in a line of data in the ASCII file, Multiplan puts the entire line in a single cell. You can skip a field on your worksheet by immediately following a delimiter with a second delimiter in the ASCII file.

NOTE If you use a space as a delimiter, Multiplan accepts any number of spaces between one field and another as a single delimiter. This allows you to directly use reports printed to a file without eliminating spaces in the report.

Loading from the Windows Clipboard

Multiplan can load worksheets from the Microsoft Windows Clipboard. When the Clipboard is available, it appears as a normal entry in any online list. If you select this entry or type **clipboard** in the "filename" field, you can load information from the Clipboard. "Clipboard" is not the name of an actual file, but typing it in the "filename" field instructs Multiplan to exchange information with Microsoft Windows.

You can load and save only SYLK or ASCII files to the Clipboard.

Example To load ASCII information from the Windows Clipboard:

```
TRANSFER LOAD filename: Clipboard                    at: R1C1
        numbers:(Yes)No      query:(Yes)No      delimiters: ^s,^t
```

See Also **Transfer Options** **Transfer Save**

Transfer Options

TRANSFER OPTIONS mode: Normal Symbolic Other Excel Chart ASCII
setup: C:\MP

Changes the proposed (default) setting for the "filename" and "mode" fields in the Transfer Save command for new worksheets, and provides support for transferring ASCII data.

- In the "mode" field, select the file mode you want Multiplan to propose when you save a newly-created worksheet. If you set this field to ASCII, then the fields in the Transfer Load and Transfer Save commands change to accommodate the transfer of ASCII data.
- In the "setup" field, enter the default drive and directory path that you want Multiplan to propose in all subsequent Transfer commands that affect new worksheets. Or set this field to a period (.) if you want to specify the current DOS or OS/2 directory path.

Setting the File Mode

The proposed response in the "mode" field of the Transfer Save command is determined by the file format that Multiplan used when it loaded the active worksheet or the most recent format used to save the worksheet with the Transfer Save command.

However, for new worksheets—worksheets that you did not load, have not yet saved, and are still named TEMP, or TEMP1, or TEMP2, and so on—you can use the "mode" field of the Transfer Options command to propose a response for the "mode" field of the Transfer Save command, so that when you save a worksheet for the first time, the proposed file mode is the one you want. The responses for the "mode" field are:

Response	Result
Normal	Multiplan's native binary file format
Symbolic	The Symbolic Link (SYLK) format
Other	The Lotus 1-2-3 or Symphony file format
Excel	The binary interchange file format (BIFF) used by Microsoft Excel
Chart	A binary interchange file format (BIFF) compatible with Microsoft Chart and Multiplan 4.0
ASCII	ASCII text files, such as worksheet or database information printed to a disk file

NOTE Multiplan uses some formats and functions that are not supported in Microsoft Excel.

Whenever possible, use Normal mode for saving and loading files. Files in Normal mode load and save much faster than files in the other modes.

Example Suppose Multiplan is started on drive C. To set the default drive to A and the default mode to Excel so that Multiplan looks on the disk in drive A for worksheet files and saves new TEMP files in the Excel format:

```
TRANSFER OPTIONS mode: Normal Symbolic Other(Excel)Chart ASCII
                 setup: A:
```

See Also **Transfer Load** **Transfer Save**

Transfer Rename

```
TRANSFER RENAME filename: C:\MP\TEMP
```

Saves the active worksheet in Normal mode under a new name, adjusts external links to supporting and dependent worksheets, and deletes the file with the previous worksheet name. (Worksheets saved in the Excel or Chart mode retain that file format.)

- In the "filename" field, enter the new name you want to give your worksheet.

IMPORTANT This command is not the same as the DOS or OS/2 Rename command. If you use the DOS or OS/2 Rename command to rename a worksheet, it does not change the external links to other worksheets. For information on external links, see "Linking Worksheets" in Chapter 4, "Linking."

If the worksheet was previously saved in a mode other than Normal, Excel, or Chart, then using the Transfer Rename command results in the error message, *Not a valid option.*

Example To rename the active worksheet to JULY90:

```
TRANSFER RENAME filename: JULY90
```

See Also **Transfer Load** **Transfer Save**

Transfer Save

Saves the active worksheet as a file that you can load later with the Transfer Load command or as a file that you can export to other programs.

With Normal, Symbolic, Excel, Chart, or Other mode selected in the Transfer Options command:

```
TRANSFER SAVE filename: C:\MP\TEMP                protected: Yes(No)
                mode: (Normal)Symbolic Other Excel Chart
```

The following fields appear when an option other than ASCII is selected in the "mode" field of the Transfer Options command.

- In the "filename" field, enter the directory path and filename you want the file to have when you save it. The proposed name is the name of the active worksheet. If the file has not yet been saved, the current name is TEMP or TEMP1, or TEMP2, and so on, up to TEMP7, depending on how many new windows you've opened and then cleared with the Transfer Clear Window command.
- In the "protected" field, select Yes if you want to save the worksheet with password protection.
- In the "mode" field, select the file format you want to save the file in. If you're not transferring ASCII information, the proposed mode is determined by the format you last saved the worksheet in, the format that Multiplan automatically used to load the worksheet (if you haven't saved the worksheet since you loaded it), or the setting of the "mode" field in the Transfer Options command if the worksheet is new.

With ASCII mode selected in the Transfer Options command, and with a tab as a delimiter:

```
TRANSFER SAVE filename: C:\MP\TEMP                delimiter: ^t
                save area: R1:R4095
```

The following fields appear when ASCII is selected in the "mode" field of the Transfer Options command.

- In the "delimiter" field, enter the character you want to use as a delimiter (or separator) when you save.
- In the "save area" field, enter the reference of the specific worksheet area you want to save as ASCII information. The default is R1:4095, the entire worksheet.

If the filename is a duplicate of one that exists already, the message *Enter Y to overwrite file* appears when you press Enter. Press Y to replace the previous file with the worksheet on the screen. Pressing any other key cancels the Transfer Save command.

Saving in Different Formats

You can save your Multiplan files in Normal, Symbolic, Excel (BIFF), Other, or Chart formats by making sure that ASCII is not selected in the "mode" field of the Transfer Options command and then selecting the file format you want in the "mode" field of the Transfer Save command. Normal mode is the fastest, most efficient way to save and load files. See "Transfer Options" and "Transfer Load" in this chapter for a more complete explanation of Normal, Symbolic, Other, Excel, Chart, and ASCII formats.

NOTE To save worksheets from Multiplan version 4.0 in Normal mode, choose Transfer Save and select Normal. Worksheets created in Multiplan version 2.0 or 3.0 are automatically saved in Normal mode when you choose the Transfer Save command. For more information, see "Using Worksheets from Previous Versions of Multiplan" in the "Getting Started" chapter and "Converting Worksheets from Previous Versions of Multiplan" in Appendix C, "Tips and Additional Information About Multiplan."

Saving in ASCII Format

To save a file in ASCII format, ASCII must already be selected in the "mode" field of the Transfer Options command. You must tell Multiplan what character you want to use as a delimiter. You can use only a single delimiter character. Indicate a space or a tab by typing **^s** for space and **^t** for tab. For more information, see "Transfer Load" in this chapter. You use a delimiter to separate columns. For example, consider the following rectangular block of six cells.

```
abc     def     ghi
4               12
```

The preceding information would be stored in an ASCII file as "abc <delimiter> def <delimiter> ghi <carriage return> 4 <delimiter> <delimiter> 12 <carriage return>" where <delimiter> is the character you specify in the "delimiter" field.

NOTE If you have selected ASCII in the "mode" field of the Transfer Options command and if you save the worksheet by selecting the Quit command and pressing Y at the *Enter Y to save edits, N to lose edits, or press Esc to cancel* message, then Multiplan saves the worksheet in Normal mode to preserve formats and formulas.

Saving in Lotus Format

If you want to save a Lotus 1-2-3 or Symphony file, first select Other in the "mode" field, and then type the worksheet filename with one of the following extensions:

Desired format	Extension
Lotus 1-2-3, version 1 or 1a	WKS
Lotus 1-2-3, version 2	WK1
Symphony, version 1	WRK
Symphony, version 1.1	WR1

Saving in Chart Format

When you save in Chart format, Microsoft Chart can read the file and create charts from the data. Microsoft Chart does not support this kind of password-protected file, so do not select Yes in the "protected" field when you want to create a file for use with Microsoft Chart. If you do, Multiplan displays the message, *Not a valid option.*

Saving with a Password

To prevent unauthorized changes and theft of data, you can restrict access to Multiplan worksheets by encrypting the data. **Encryption** is the process of using a password you supply as the key to protecting your data. With Multiplan, you can enter a password when you save your worksheet. To load the worksheet, you must supply the password. Multiplan uses the password to decrypt the data so you can use it.

If the "protected" field of the Transfer Save command is set to Yes, Multiplan asks you for a password. Type a password and press Enter. You can use any displayable characters, such as letters, numbers, or punctuation, but not spaces and control characters. Multiplan distinguishes between uppercase and lowercase letters in passwords.

Multiplan asks you to type the password a second time to verify that you typed the password correctly. If you do not type the password the same way the second time as you did the first time, Multiplan warns you and then returns you to the command menu without saving or encrypting the worksheet.

WARNING If you forget the password, there is no way to recover the worksheet. If you are concerned about forgetting your password, write it down and store it in a safe place.

NOTE If you select Chart or Symbolic in the "mode" field or if you select Other in this field and use a filename ending in .WKS, then you cannot select Yes in the "protected" field because data encryption is not supported by these file formats. Multiplan displays the message *Not a valid option* if you try to save the worksheet with password protection in one of these formats.

Saving to the Windows Clipboard

You can load and save only SYLK or ASCII files to the Clipboard. You cannot use the Clipboard with binary worksheet files (standard Multiplan, Excel, Chart, or Lotus 1-2-3 files). Choose Transfer Options and select ASCII in the "mode" field and then choose Transfer Save and type **clipboard** in the "filename" field. "Clipboard" is not the name of an actual file, but typing it in the "filename" field instructs Multiplan to exchange information with Microsoft Windows.

Examples To save the active worksheet under the name PRACTICE in the Excel format:

```
TRANSFER SAVE filename: c:\mp\practice          protected: Yes(No)
              mode: Normal Symbolic Other(Excel)Chart
```

To save to the Windows Clipboard in the ASCII format:

```
TRANSFER SAVE filename: clipboard              delimiter: ^t
              save area: R1:4095
```

To save PRACTICE in the Normal format:

```
TRANSFER SAVE filename: c:\mp\practice          protected: Yes(No)
              mode: (Normal)Symbolic Other Excel Chart
```

See Also **External Copy** **Transfer Load**
Print File **Transfer Options**

Value

VALUE:

Enters a formula or a number into the active cell.

You can choose Value from the command menu by highlighting Value and pressing Enter, or by pressing V. You can also choose Value by:

- Typing any digit, 0–9
- Typing one of the characters = + - . ("

If you begin a formula with an equal sign (=), you do not see the equal sign on the screen.

NOTE If you select comma (,) as the decimal separator with the Format Options command, the Value command recognizes the comma rather than the period (.).

After choosing the Value command, you enter relative references by pressing the direction keys.

Press Enter or a direction key to carry out the Value command. If you press a direction key, Multiplan then displays this prompt:

ALPHA/VALUE:

and waits for you to enter text or another value. You can also use the "A/V" field in the Options command to get the Alpha/Value prompt. For more information on the Alpha/Value prompt, see "Alpha" in this chapter.

You can enter text with the Value command if you enclose the text in double quotation marks.

Note that dates, such as 3/21/90, can be interpreted as formulas. Be sure to enter dates with the Alpha command if you want to store them as date serial numbers, or choose the Value command and enclose them in double quotation marks if you want to store them as text. For more information, see "Entering Dates and Times as Text" in Chapter 6, "Dates, Times, and Custom Formats."

Example To enter the formula SUM(R1:R3) into R1C1, first type = , and then type the formula after the Value prompt:

```
VALUE: sum(r1:r3)
```

See Also **Alpha** **Options**
Edit

Window

```
WINDOW: Split Border Close Link Paint
```

Presents a choice of window operations.

- Window Split opens a new window by splitting the active window horizontally or vertically, or opens a window used for titles.
- Window Border adds or removes a border and filename around a window and sets the page break display.
- Window Close closes a window and removes it from the screen.
- Window Link links two windows so their contents scroll together.
- Window Paint selects colors.

Pressing F1 or ; (semicolon) moves the cell pointer from one window to the next. Pressing Shift+F1 moves the pointer back to the preceding window.

NOTE The semicolon moves the cell pointer from one window to the next only if the period is specified as the decimal separator. For more information, see "Format Options" in this chapter.

The Window subcommands are explained on the following pages.

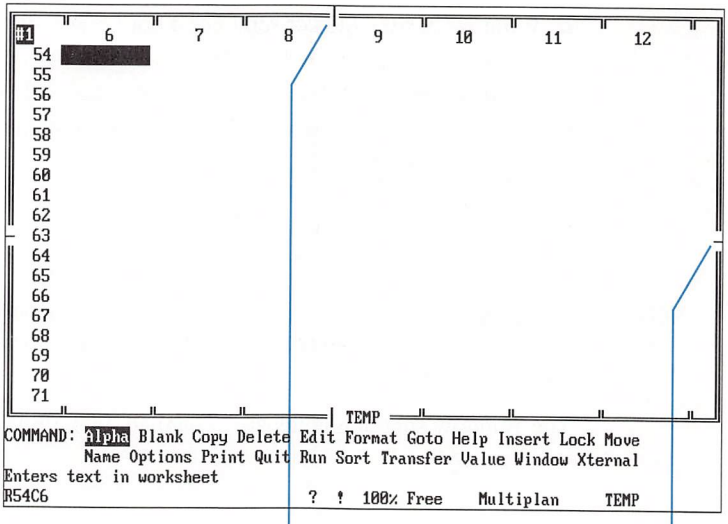
Window Border

WINDOW change border in window number: 1 show filename:(Yes)No
show page breaks: Yes(No)

Changes the border of the specified window or shows page breaks.

- In the "change border in window number" field, enter the number of the window you want to add a border to or remove a border from. If the window already has a border, the border is removed. If it lacks a border, one is added.

  A border takes up one screen position on each side of the window, reducing the display area of the worksheet by two rows and two character columns.
- In the "show filename" field, select Yes if you want to display the filename in the border.
- In the "show page breaks" field, select Yes if you want to display horizontal and vertical page breaks on the border. Horizontal page breaks are indicated by hyphens in the window border. Vertical page breaks are indicated by vertical bars in the window border.



Vertical page break indicator *Horizontal page break indicator*

Multiplan can display up to 20 horizontal and 20 vertical page breaks. You control where page breaks occur with the fields in the Print Margins command.

Window Border settings are saved in the MP.INI file when you quit Multiplan. For more information, see "The MP.INI File" in Appendix C, "Tips and Additional Information About Multiplan."

Example To turn on the border and display the filename in window 2:

```
WINDOW change border in window number: 2        show filename:(Yes)No
                                                show page breaks: Yes(No)
```

See Also **Format Default Height** **Print Margins**
Options **Window Split**

Window Close

```
WINDOW CLOSE window number: 1
```

Removes the specified window from the screen.

- Set the "window number" field to the window you want to close. The active window is the proposed response.

The remaining windows enlarge to occupy the screen area that the closed window previously used. Multiplan renumbers the other windows. Closing a window does not affect cell contents. If you have changed the worksheet in a particular window, when you choose the Window Close command, Multiplan displays the message, *Enter Y to save edits, N to lose edits, or press Esc to cancel.*

If only one window is open, Multiplan ignores the Window Close command.



You can close a window with the mouse by moving the mouse pointer to the border of the window you want to close and clicking both buttons.

Example To close window 2:

```
WINDOW CLOSE window number: 2
```

See Also **Window Split**

Window Link

WINDOW LINK window number: 1 with window number: 1 linked: Yes(No)

Links or unlinks windows so they scroll together.

This command does not establish external links as the External Copy command does.

- In the "window number" field, enter the number of the window you want to link to another window.
- In the "with window number" field, enter the number of the window you want to link the first window to.
- In the "linked" field, select Yes if you want to link the windows or No if you want to unlink them.

You can enter any two window numbers as responses in the "window number" and "with window number" fields, but you can link only windows that contain the same worksheet and share a horizontal or vertical edge. If you attempt to link other pairs, Multiplan displays the message, *Cannot link those windows.* The proposed responses are the active window and either a window split from the active window or the window from which the active window was split. If no window splitting has occurred, both proposed window responses are the active window.

When you link windows, the contents of the two windows scroll together. If the window split is horizontal, the synchronized scrolling is horizontal. If the window split is vertical, the synchronized scrolling is vertical.

When you link two previously unlinked windows, one set of row or column numbers disappears from the screen. If you previously split the windows horizontally, the lower set of column numbers disappear, and you identify columns by the numbers in the upper window. If you previously split the windows vertically, the row numbers in the right window disappear, and you identify the rows by the numbers in the left window.

You cannot unlink windows split by the Window Split Titles command.

You can also establish scrolling links by choosing Window Split Horizontal or Window Split Vertical and selecting Yes in the "linked" field.

Example Window #4 was split from window #1. To link them so that they scroll together:

WINDOW LINK window number: 1 with window number: 4 linked:(Yes)No

See Also **Window Split**

Window Paint

```
WINDOW PAINT foreground: 7   background: 0   border: 7   menu: 7
```

Selects the colors for the display of the active worksheet and menus.

- In the "foreground" field, enter the number corresponding to the color you want for the foreground.
- In the "background" field, enter the number corresponding to the color you want for the background.
- In the "border" field, enter the number corresponding to the color you want for the window border.
- In the "menu" field, enter the number corresponding to the color you want for the menus.

Setting the Window Paint Fields

Press F1 to choose the window you want to color. Select the colors by typing the color code number or by pressing a direction key. When you press a direction key, the specified color appears on the screen. The direction keys select colors as follows:

Key	Selects
Right Arrow	The next higher color number
Left Arrow	The next lower color number
Down Arrow	The highest color number (7)
Up Arrow	The lowest color number (0)

Press Enter to accept the selected colors, or press Esc to return the worksheet to the original colors.



You can also select a color by pointing the mouse to a particular color field and clicking the right mouse button.

The color codes are listed in the following table:

Color code	Color
0	Black
1	Blue
2	Green
3	Cyan
4	Red
5	Magenta
6	Yellow
7	White

If you create and color a worksheet on a color monitor and later display the worksheet on a different type of monitor, the worksheet may not appear with the colors you set on the first monitor.

On an IBM monochrome or similar black-and-white display, colors appear as different shades; you can combine certain settings to produce special results:

- Enter 0 in the "foreground" field and 7 in the "background" field if you want to display dark characters on a light background.
- Enter 1 in the "foreground" field if you want to underscore across the rows.
- Enter 1 in the "border" field if you want to mark rows on the window border (of different brightness).
- Enter 0 in the "border" field and 7 in the "background" field if you want to display a light band along the window border.

Because the color/graphics monitor adapter does not support gray shades, the results may be unpredictable if you use a color other than 0 or 7 on a black-and-white monitor attached to this adapter.

The Window Paint values are saved in the MP.INI file when you exit Multiplan. For more information, see "The MP.INI File" in Appendix C, "Tips and Additional Information About Multiplan."

Example To display the worksheet contents as yellow on a blue background with a white border:

```
WINDOW PAINT foreground: 6    background: 1    border: 7    menu: 7
```

See Also **Window Border**

Window Split

WINDOW SPLIT: Horizontal Vertical Titles

Presents a choice of three ways to open a new window by splitting the active window.

- Window Split Horizontal splits the active window horizontally, making two windows, one above the other.
- Window Split Vertical splits the active window vertically, making two windows, side by side.
- Window Split Titles splits the active window both vertically and horizontally to display row or column headings in separate windows.

You may open up to eight windows with the Window Split commands. Multiplan gives the new window a border if the original window has one.

The Window Split subcommands are explained below.

See Also **Window Border** **Window Link**
Window Close

Window Split Horizontal

WINDOW SPLIT HORIZONTAL at row: 1 linked: Yes(No)

Splits the active window horizontally.

Multiplan gives the new window the next unused window number and makes it the active window.

- In the "at row" field, enter the number of the row at which you want to open a new window. This row and the rows below it become the new window.
- In the "linked" field, select Yes if you want to link the windows for scrolling, on the same worksheet. You cannot link windows containing different worksheets.

When you link windows, whenever you scroll one of the windows horizontally, the windows scroll together. Notice also that the column numbers of the lower window do not appear on the screen. Use the column numbers in the upper window to identify the columns in the linked window.



You can split the window with the mouse by pointing at the window border where you want to split the window and clicking either button (the window must already have a border). Windows split in this way are not linked for scrolling.

Example To split the active window at row 34, and to link the windows:

WINDOW SPLIT HORIZONTAL at row: 34 linked:(Yes)No

See Also **Window Border** **Window Link**

Window Split Titles

WINDOW SPLIT TITLES # of rows: 0 # of columns: 0

Splits the active window into two or four windows that are linked so that they scroll together.

- In the "# of rows" field, enter the number of rows you want to reserve for displaying titles. The specified number of rows becomes a window at the top of the screen, unless you set this field to 0.
- In the "# of columns" field, enter the number of columns you want to reserve for displaying titles. The specified number of columns becomes a window at the left of the screen, unless you set this field to 0.

The proposed responses split the window so that the active cell becomes the upper-left corner cell of the active window.

After you reserve rows and columns for titles, the remaining display space becomes the active window. The active window is linked for horizontal movement with the window above it, and for vertical movement with the window to its left, if both rows and columns have been reserved for titles.

You cannot unlink windows that have been linked with this command.



You can split the window with the mouse by pointing to the window border where you want to split the window and then clicking either button.

Example Suppose that column 1 contains descriptive headings for the rows of the worksheet, and that columns 2 through 25 contain data matching those headings. You would like to scroll the data columns horizontally while holding the headings fixed on the screen. If you scroll vertically, both headings and data should move so that the headings remain aligned with the matching data. Move the cell pointer to R1C2, and choose Window Split Titles. The proposed responses are:

WINDOW SPLIT TITLES # of rows: 0 # of columns: 1

See Also **Window Border**

Window Split Vertical

WINDOW SPLIT VERTICAL at column: 1 linked: Yes(No)

Splits the active window vertically.

Multiplan gives the new window the next unused window number and makes it the active window.

- In the "at column" field, enter the column at which you want to open a new window. This column and the columns to its right become the new window.
- In the "linked" field, select Yes if you want to link the windows for scrolling, on the same worksheet. You cannot link windows containing different worksheets.

When you link windows, whenever you scroll one of the windows vertically, the windows scroll together. Notice also that the row numbers of the right window do not appear on the screen. Use the row numbers in the left window to identify rows in the linked window to the right.



You can split the window with the mouse by pointing at the window border where you want to split the window and clicking either button (the window must already have a border). Windows split in this way are not linked for scrolling.

Example To split the window at column 3 and link the two new windows:

WINDOW SPLIT VERTICAL at column: 3 linked:(Yes)No

See Also **Window Border** **Window Link**

Xternal

See External.

14 Formulas and Functions

This chapter describes formulas and Multiplan's built-in functions.

A **formula** calculates values using standard mathematical operations in combination with the information on a worksheet.

A **function** is an operator you can use to do a variety of calculations. A function is similar to a mathematical operator, such as + or –, in that it produces a new value from other values. Some common functions are SUM, AVERAGE, and COS.

Formulas and functions work together. You enter functions as part of a formula by choosing the Value command. For example, suppose you want to know the answer to 10 times the sum of rows one through five. You could use a function and a formula together by typing = at the main command menu and entering this formula:

SUM(r1:r5)*10

To calculate an answer, the formula uses the SUM function and its arguments, the mathematical operator for multiplication (*), and the number 10.

Formulas

This section explains formulas and the components you use to build formulas. Multiplan can use a number of different types of information in formulas:

This type of information	Is used
Numbers	For financial, statistical, scientific, and other calculations
Mathematical operators	To combine numbers arithmetically
Text	As a displayed result
The text operator	To join text
Cell references	To refer to the information in another cell or cells on the worksheet
Cell reference operators	To combine cell references
Dates and times	In date and time calculations
Logical operators	In making conditional ("either-or") decisions
Error values	As substitutes for values that cannot be calculated because of a mistake in a formula

The following sections describe each type of information.

Numbers

You can write numbers as:

- Integers
- Decimal fractions
- Percentages
- Scientific notation

Integers are positive or negative numbers with no fractional part, such as 123 or –3,938.

Decimal fractions are numbers that have a decimal value, such as 123.45 or –2,389.741.

Percentages are integers or decimal fractions followed by a percent sign (%). For example, 15% means .15 or 15/100.

Scientific notation has an integer or decimal fraction, known as the **mantissa**, followed by the letter "E" and a positive or negative integer exponent. This notation multiplies the mantissa by 10 raised to the power given after "E." For example:

- 12.1E2 means 1,210 (12.1×10^{2}).
- 1E–5 means .00001 (1×10^{-5}).
- 1.5E+6 means 1,500,000 (1.5×10^{6}).

Numbers are calculated with 14 digits of precision and a decimal exponent ranging from –307 to +307. This means that the smallest positive number is 1×10^{-307} or 1E–307, and the largest one is $9.99999999999999 \times 10^{+307}$ or 9.99999999999999E307.

Mathematical Operators

You can combine numbers with **mathematical operators**. A mathematical operator is a symbol telling Multiplan to perform a mathematical operation on the number or numbers on either side.

Multiplan uses the following mathematical operators:

Operator	Meaning
+	Addition
–	Subtraction—may also be used in front of a value to denote negative
*	Multiplication
/	Division
%	Percent—written after the value and has the same meaning as dividing by 100
^	Exponentiation—for example, Multiplan interprets the expression A^2 as A^2

Order of Operations in a Formula

Multiplan performs mathematical and logical operations in the following order:

- Sign (in other words, whether the number is positive or negative)
- Percentage
- Exponentiation
- Multiplication and division
- Addition and subtraction
- Logical operations (described in "Logical Operators," later in this chapter)

When you have more than one mathematical operator of equal precedence in a formula, Multiplan calculates them from left to right. For example, A*B/C is processed as A multiplied by B, and then the result divided by C.

You can alter the order in which Multiplan performs the operations in the calculation by using parentheses. Multiplan calculates expressions inside parentheses first. For example, A*(B+C) is processed as B plus C, and then the result is multiplied by A. This result is not necessarily the same as A*B+C.

Text

A single text item may contain up to 255 characters. In a formula, text is written enclosed within double quotation marks (""). For example:

- "Salary =" is eight characters of text (spaces count as characters).
- "1.0" is text, not a number, because it is enclosed in double quotation marks.

Text cannot include double quotation marks as a character.

Text Operator

You can join one text item to the end of another with an ampersand (&). The result is a single text item consisting of the first text item immediately followed by the second. For example, if R1C1 contains "Hello " and R1C2 contains "there, " and R1C3 contains "John!" then R1C1&R1C2&R1C3 equals "Hello there, John!" Joining text in this way is also called **concatenation**.

Cell References

Cell references specify cells. They consist of a row reference and a column reference, in that order.

For example, R4C3 is a reference to the cell at row 4, column 3. If the cell contains the value 5, the result of the formula R4C3+1 is 6.

You can write cell references three ways:

- As absolute references
- As relative references
- As names

Absolute References

An absolute reference identifies a specific cell or group of cells on a worksheet. You do not need to know where you are on the worksheet to find a location identified with an absolute reference. For example, R5C4 always identifies the cell at the intersection of row 5 and column 4.

You can use absolute references to specify entire rows and columns:

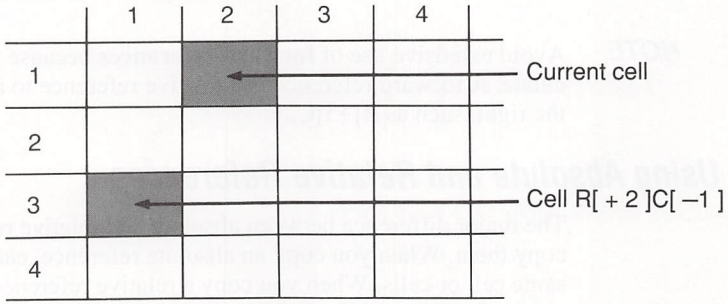
Reference	Meaning
R2	Row 2
C10	Column 10
R2:15	All rows from 2 through 15, inclusive
C12:41	All columns from 12 through 41, inclusive

You can join row and column absolute references to specify a cell or group of cells:

Reference	Meaning
R4C10	The cell at row 4, column 10
R4:7C6:10 (or R4C6:R7C10)	A rectangle of cells from row 4 through row 7 and from column 6 through column 10

Relative References

A relative reference describes the location of a cell or group of cells in relation to the location of another cell. A relative reference gives directions by using "+" for right or down and "–" for left or up and a number indicating how many rows or columns the cell is from the current cell.



The cell being referred to is two rows down from the current cell (+2) and one column left of the current cell (–1).

You can use relative references to specify rows and columns:

Reference	Meaning
R	Current row
C	Current column
R[+2]	The row that is 2 rows below R (the + can be omitted)
C[+3]	The column that is 3 columns to the right of C (the + can be omitted)
R[–4]	The row that is 4 rows above R
C[–1]	The column that is 1 column to the left of C

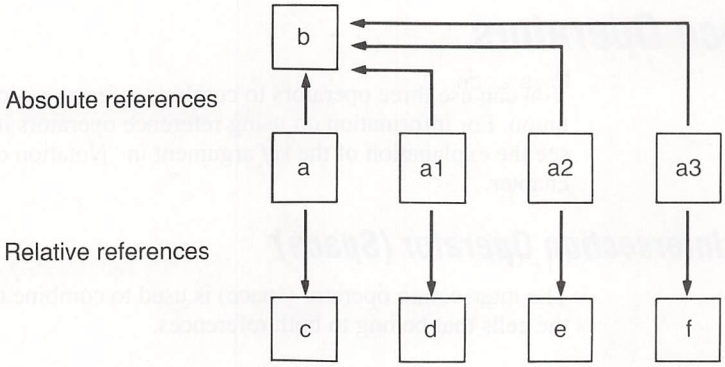
As with absolute references, you can join row and column references to specify a cell or group of cells:

Reference	Meaning
RC[–1]	The single cell just to the left of the current cell
R[–1]C[–1]:R[+3]C[+3]	The rectangle of cells whose upper-left corner is one row above and one row to the left of the active cell and whose lower-right corner is three rows below and three columns to the right of the active cell. This range includes the active cell.

NOTE Avoid extensive use of **forward references** because they are slower to recalculate. A forward reference is a relative reference to a cell farther down or to the right, such as R[+5]C.

Using Absolute and Relative References

The major difference between absolute and relative references occurs when you copy them. When you copy an absolute reference, each copy always refers to the same cell or cells. When you copy a relative reference, the same expression may refer to a different location depending on where the current cell is.



If a reference in cell a is absolute and refers to cell b, the copied references in cells a1, a2, and a3 will all refer to cell b.

If a reference in cell a is relative and refers to cell c as 3 rows down [+3], cell a1 will refer to cell d (not cell c), cell a2 will refer to cell e, and cell a3 will refer to cell f.

Names

Names are used to identify a cell or group of cells. Names are defined with the Name command and are always absolute references.

Names must start with a letter. The first letter may be followed by letters, digits, periods, and underline (_) characters up to a maximum of 31 characters. Names cannot contain any spaces or hyphens. Use the underline character instead of a space. In addition, words that are the same as absolute or relative references, such as R1C1, R, or C, cannot be used as names.

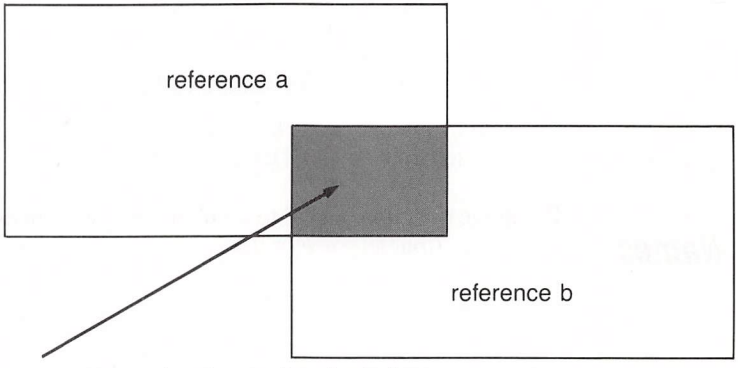
Names are useful for identifying the purpose of a group of cells. For example, you might define the name "Sales" to refer to R3C2:8. The name suggests that these cells involve sales figures of some kind. The absolute reference R3C2:8 does not identify the purpose of the cells. However, the name "Sales" and the absolute reference R3C2:8 are identical to Multiplan: they both refer to the same group of cells.

Reference Operators

You can use three operators to combine references: intersection, range, and union. For information on using reference operators in arguments of functions, see the explanation of the *ref* argument in "Notation of Arguments" later in this chapter.

Intersection Operator (Space)

The intersection operator (space) is used to combine two references to refer to all the cells that belong to both references.

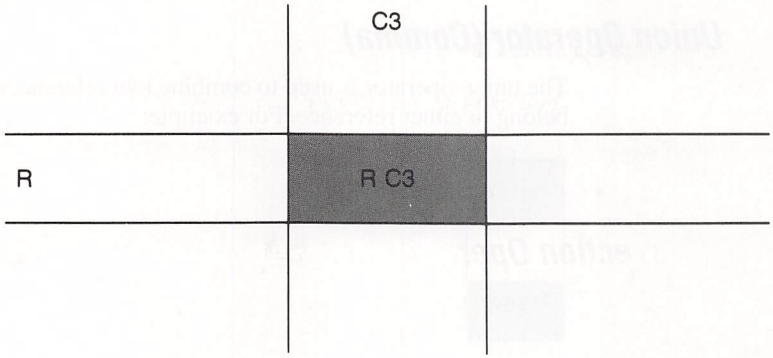


Intersection a b refers to the shaded area.

(space)

In the preceding illustration, a and b are both ranges. Their intersection (represented by the shaded area) is the area they have in common.

You use the intersection operator to combine dissimilar types of references. For example, to describe the intersection of the current row (R) and column 3 (C3), you could use the reference R C3. You cannot use the reference RC3 without the intersection operator because R is a relative reference while C3 is an absolute reference.

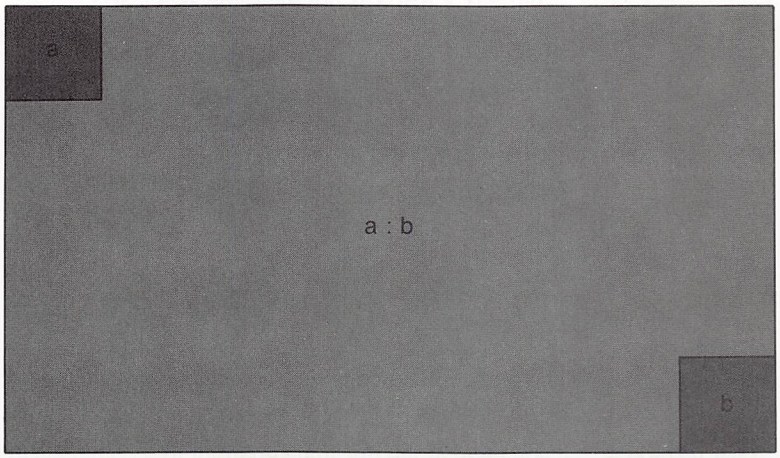


You can use the intersection operator to combine any two names, absolute references, or relative references. If the two references do not intersect, Multiplan returns a #NULL! error value.

Range Operator (Colon)

The range operator is used to combine two references to specify a group of contiguous (touching) cells. The area of a range is the smallest rectangle that includes both references.

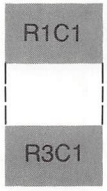
Typically, in a range written as a:b that creates a rectangle covering multiple rows and columns, the a reference is in the upper-left corner and the b reference is in the lower right. For example:



The range operator may be used to combine names, absolute references, and relative references in any order and combination.

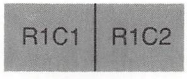
Union Operator (Comma)

The union operator is used to combine two references to refer to all cells that belong to either reference. For example:

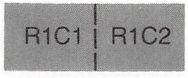


R1C1,R3C1

A union usually refers to cells that are not contiguous. But when a union does describe contiguous cells, it describes a rectangle just as a range reference would. In the following examples, R1C1,R1C2 is the same as R1C1:2...

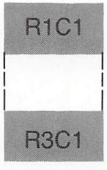


Union
R1C1,R1C2

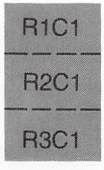


Range
R1C1:2

...but R1C1,R3C1 is not the same as R1:3C1



Union
R1C1,R3C1



Range
R1:3C1

The range reference in the second example includes cells that are not part of the two references in the union.

IMPORTANT If you change the decimal separator to a comma with the Format Options command, the union separator changes from , (comma) to ; (semicolon) so Multiplan does not confuse decimal functions and unions.

References as Values

You can use references in formulas that require a single value. When the reference describes a single cell and a single value is required, such as R1C1+1, Multiplan uses the value of the cell in the formula. The value that results can be a number, text, logical value, or error value, depending on the value in the cell.

When the reference describes a group of cells but a single value is required, Multiplan chooses the value to be used from the cell where the current row or column intersects the group of cells. In particular, for groups that are parts of rows, Multiplan chooses the value in the current column. Similarly, from parts of columns, Multiplan chooses the value in the current row. This feature is known as **implicit intersection**.

For example, in the first part of the manual, you calculated Spencer's gross profit as "Sales–Total Costs." Both Sales and Total Costs were groups of cells in a row. Multiplan chose the value to be used from the cell where the current column intersected the Sales and Total Costs rows.

Using a group of cells that are not in a contiguous row or column generally does not yield useful results, however.

Dates and Times

You enter a date or time by choosing the Alpha command and typing the date or time in a standard format. Multiplan automatically interprets the numbers and letters as a date or time and converts them to a unique serial number. If you enter a date or time in a nonstandard format, Multiplan interprets what you type as text. For a list of standard date and time formats, see Chapter 6, "Dates, Times, and Custom Formats."

Another way to have Multiplan interpret your date or time as text (not a serial number) is to choose the Value command and enclose the date or time with double quotation marks (""). If you forget the quotation marks, Multiplan treats the entry as a value and interprets the slash (/), used in some date formats, as a division symbol.

After you enter a date or time that Multiplan converts to a serial number, you can display it with any date or time format; however, if you enter a date or time as text, then you cannot display it with a date or time format.

Multiplan ignores capitalization when you enter dates and times.

NOTE When you enter an abbreviation for the month, such as "Apr", be sure to use only the first three letters of the month's name.

Logical Operators

Logical operators make comparisons between two values. Multiplan uses the following logical operators:

Operator	Meaning
=	Equal
<	Less than
<=	Less than or equal
>	Greater than
>=	Greater than or equal
<>	Not equal

The functions AND, OR, NOT, TRUE, and FALSE also perform logical operations.

You use logical operators as part of a conditional formula to make "either-or" decisions. Chapter 7, "Conditional Formulas," describes how to use logical operators in conditional formulas.

You can also use logical operators to compare text. The order in which all characters are compared is described in "Sort" in Chapter 13, "Commands."

Error Values

When a Multiplan function, operation, or reference is used incorrectly, an error value results. There are different error values for different error conditions.

Error values in one cell cause error values in all cells referring to the first cell. This means that when you notice an error value in a cell, you have to trace the error back through the cells until the source of the error is found.

You can usually resolve errors most quickly by correcting the errors that are highest and furthest to the left, and then recalculating. This method does not work well when you are using forward references.

The Run Audit Cells and Run Audit Formulas commands can help you trace and identify errors in your worksheet. For information on using these commands, see "Auditing a Cell" and "Auditing a Formula" in Chapter 10, "Auditing a Worksheet," and "Run Audit Cells" and "Run Audit Formulas" in Chapter 13, "Commands."

For a complete list of error messages and their possible causes, see "Run Report File Summary" in Chapter 13, "Commands."

Tips for Using Formulas

To save effort, place common expressions in an intermediate cell, and then refer to that cell when the expression is needed in a formula in another cell. This saves retyping and recomputing the same information.

For example, if SUM(Sales) appears in several formulas, it is more efficient to compute SUM(Sales) once in a cell and refer to that cell from other formulas than to compute SUM(Sales) for each formula. Having the intermediate result visible also helps with tracing problems in formulas.

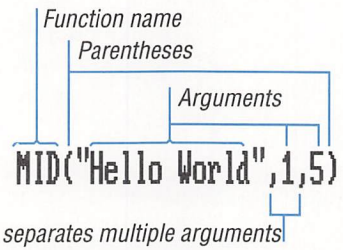
To save memory and processing time, avoid functions or operations over unnecessarily large ranges. For example, instead of SUM(R2), specify only the range of columns that contain values; for instance, SUM (R2C1:5). You could also try to restructure the function or operation so that large ranges are not necessary.

You can enter formulas in command fields to perform a command based on the condition of another cell. For example, if R1C1 contained the integer 4, you could type **r1c1** in the "number of cells" field of the Copy Down command. Multiplan would then copy the selected cells down four rows.

Functions

This section and the remaining sections in this chapter explain how to use functions.

Each function consists of the function name and a set of parentheses. Most functions also have one or more arguments, which are the values the function uses to produce a new value.



The parentheses tell Multiplan where the arguments begin and end. Do not leave any space before the left parenthesis, and be sure to finish with a right parenthesis. Use commas to separate the arguments, or use semicolons if you've specified the comma as a decimal separator.

Entering Functions into Formulas

You can enter a function into any formula. You can use uppercase or lowercase letters or a combination of both.

Here are some examples of different functions and what they do:

This function	Does this
SUM(1,2,3)	Adds 1, 2, and 3
AVERAGE(1,2,3)	Calculates the average of 1, 2, and 3
SIN(0.53)	Calculates the sine of an angle of 0.53 radians
LEN("Phil Smith")	Counts the number of characters in the text "Phil Smith"
PI()	Returns 3.1415926535898, an approximation of the mathematical constant pi (π)

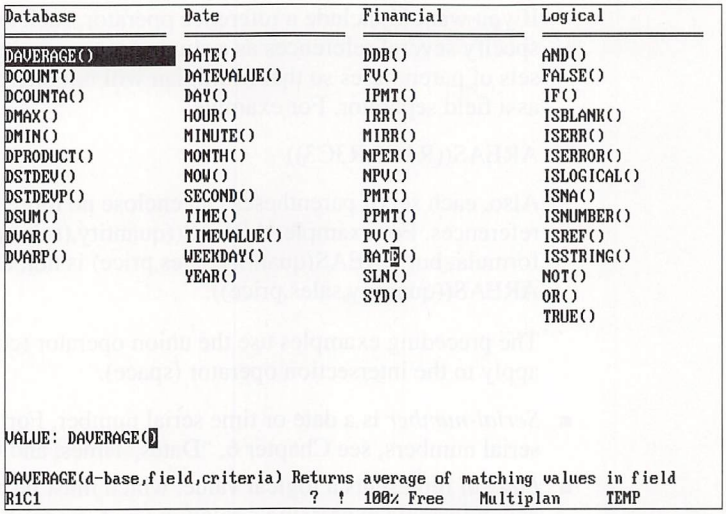
The arguments can be numbers or text, as in the preceding examples, or they can be formulas themselves. These formulas may then contain other functions. In the following example, the formula Score/10 is an argument to the INT function. This function is in turn an argument to the MID function.

MID("FFFFFFDCBAA",INT(Score/10)+1,1)

When an argument to a function is itself a function, it is **nested**. You can nest up to seven levels of functions in a formula.

You can select from a list of functions by pressing Shift+F3 (or pressing @@) and then pressing a direction key after choosing the Value command.

Press PgDn to see more functions.



When you select a function, the argument types and expected result type of the function appear in the status line. Press F3 or type @ to add the function to the formula. You can use this feature to nest functions within other functions.

Notation of Arguments

Function names are shown in uppercase characters, followed by the function arguments in parentheses.

The following list explains the standard notation used to describe arguments:

- *Number* represents either a number or a formula that yields a number.
- *Text* represents either text or a formula that yields text. If you enter text directly as an argument, you must enclose it in double quotation marks (""), or Multiplan assumes that you have entered a name reference.
- *Ref* represents a cell reference. Unless otherwise noted in the function description, a cell reference can be any of the following:
  - Absolute
  - Relative
  - A single cell
  - A range of cells
  - A name

If you want to include a reference operator, such as a comma, in *ref* and specify several references as a single argument, then you must include extra sets of parentheses so that Multiplan will not interpret the reference operator as a field separator. For example:

AREAS((R1C1,R3C3))

Also, each set of parentheses can enclose no more than two noncontiguous references. For example, AREAS((quantity,(sales,price))) is a valid formula, but AREAS(quantity,sales,price) is not, and neither is AREAS((quantity,sales,price)).

The preceding examples use the union operator (comma), but the same rules apply to the intersection operator (space).

- *Serial-number* is a date or time serial number. For more information about serial numbers, see Chapter 6, "Dates, Times, and Custom Formats."
- *Logical* represents a logical value, which must be a reference to a single cell, a formula expressing a relation (=, <, >, <=, >=, <>), or a function that returns a logical value. Otherwise, Multiplan returns a #VALUE! error.
- *Item* can be either a number or text as described earlier, or a reference to a group of cells.
- *List* represents a list of *items*, separated by commas. For example, the list 1,B (where B is a name defined as R1C2:3 and R1C2 contains the value 2 and R1C3 contains the value 3) represents the collection of values 1,2,3. Lists may be up to 14 items long, but they may represent any number of items through references.

To review the descriptions of numbers, formulas, and text, see "Formulas" at the beginning of this chapter.

Functions by Subject Category

Multiplan's functions fall into the following general subject categories:

- Database
- Date
- Financial
- Logical
- Mathematical
- Special purpose
- Statistical
- Text
- Trigonometric

The following list of functions shows you what functions are available within each category. A detailed description of all the functions, arranged in alphabetic order, follows the list.

Database Functions

DAVERAGE(*database,"field",criteria*)
Averages the values in the *field* column of records in the *database* that satisfy the *criteria*

DCOUNT(*database,"field",criteria*)
Counts the cells that contain numbers in the *field* column of records in the *database* that satisfy the *criteria*

DCOUNTA(*database,"field",criteria*)
Counts the cells that are not blank in the *field* column of records in the *database* that satisfy the *criteria*

DMAX(*database,"field",criteria*)
Returns the largest number in the *field* column of records in the *database* that satisfies the *criteria*

DMIN(*database,"field",criteria*)
Returns the smallest number in the *field* column of records in the *database* that satisfies the *criteria*

DPRODUCT(*database,"field",criteria*)
Multiplies the values in the *field* column of records in the *database* that satisfy the *criteria*

DSTDEV(*database,"field",criteria*)
Estimates the standard deviation of a population based on a sample, using the numbers in the *field* column of records in the *database* that satisfy the *criteria*

DSTDEVP(*database,"field",criteria*)
Calculates the standard deviation of a population based on the entire population, using the numbers in the *field* column of records in the *database* that satisfy the *criteria*

DSUM(*database,"field",criteria*)
Adds the numbers in the *field* column of records in the *database* that satisfy the *criteria*

DVAR(*database,"field",criteria*)
Estimates the variance of a population based on a sample, using the numbers in the *field* column of records in the *database* that satisfy the *criteria*

DVARP(*database,"field",criteria*)
Calculates the variance of a population based on the entire population, using the numbers in the *field* column of records in the *database* that satisfy the *criteria*

Date Functions

DATE(*year,month,day*)
Returns the serial number of the specified date

DATEVALUE(*text*)
Converts *text* to a date serial number

DAY(*serial-number*)
Converts *serial-number* to a day of the month

HOUR(*serial-number*)
Converts *serial-number* to an hour of the day

MINUTE(*serial-number*)
Converts *serial-number* to a minute

MONTH(*serial-number*)
Converts *serial-number* to a month of the year

NOW()
Returns the serial number of current date and time at time of last recalculation

SECOND(*serial-number*)
Converts *serial-number* to a second

TIME(*hour,minute,second*)
Returns the serial number of the specified time

TIMEVALUE(*text*)
Converts *text* to a time serial number

WEEKDAY(*serial-number*)
Converts *serial-number* to a day of the week

YEAR(*serial-number*)
Converts *serial-number* to a year

Financial Functions

DDB(*cost,salvage-value,useful-life,period,factor*)
Returns the depreciation of an asset for a specific *period* based on the asset's initial *cost, salvage-value,* and *useful-life,* using *factor* for the rate at which the balance is to decline

FV(*rate,nper,pmt,pv,time-of-pmt*)
Returns the future value of an investment

IPMT(*rate,period,nper,pv,fv,type*)
Returns the interest payment for a given period for an investment based on periodic, constant payments and a constant interest rate

IRR(*ref,guess*)
Returns the internal rate of return of cash flows in *ref*

MIRR(*ref,safe,risk*)
Returns the modified internal rate of return of cash flows in *ref*

NPER(*rate,pmt,pv,fv,time-of-pmt*)
Returns the number of payments for an investment

NPV(*rate,list*)
Returns the net present value of *list*

PMT(*rate,nper,pv,fv,time-of-pmt*)
Returns the periodic payment for an investment

PPMT(*rate,period,nper,pv,fv,type*)
Returns the payment on principal for a given period for an investment based on periodic, constant payments and a constant interest rate

PV(*rate,nper,pmt,fv,time-of-pmt*)
Returns the present value of an investment

RATE(*nper,pmt,pv,fv,time-of-pmt,guess*)
Returns the rate returned for an investment

SLN(*cost,salvage-value,useful-life*)
Returns the straight-line depreciation for an asset for a single period

SYD(*cost,salvage-value,useful-life,period*)
Returns the sum-of-years' digits depreciation for an asset for a specified period

Logical Functions

AND(*list*)
Returns TRUE if all logical values in *list* are TRUE; otherwise, returns FALSE

FALSE()
Returns the logical value FALSE

IF(*logical,value-if-true,value-if-false*)
Returns *value-if-true* if *logical* is TRUE; returns *value-if-false* if *logical* is FALSE

ISBLANK(*item*)
Returns TRUE if *item* is a blank cell; otherwise, returns FALSE

ISERR(*item*)
Returns TRUE if *item* is any Multiplan error value except #N/A; otherwise, returns FALSE

ISERROR(*item*)
Returns TRUE if *item* is any error value; otherwise, returns FALSE

ISLOGICAL(*item*)
Returns TRUE if *item* is a logical value; otherwise, returns FALSE

ISNA(*item*)
Returns TRUE if *item* is the error value #N/A; otherwise, returns FALSE

ISNUMBER(*item*)
Returns TRUE if *item* is a number or blank; otherwise, returns FALSE

ISREF(*item*)
Returns TRUE if *item* is a reference; otherwise, returns FALSE

ISSTRING(*item*)
Returns TRUE if *item* is text; otherwise, returns FALSE

NOT(*logical*)
Returns TRUE if *logical* is FALSE; returns FALSE if *logical* is TRUE

OR(*list*)
Returns TRUE if any logical value in *list* is TRUE; otherwise, returns FALSE

TRUE()
Returns the logical value TRUE

Mathematical Functions

ABS(*number*)
Returns the absolute value of *number*

EXP(*number*)
Returns e to the power *number*

FACT(*number*)
Returns the factorial of *number*

INT(*number*)
Returns the largest integer that is less than or equal to *number*

LN(*number*)
Returns the natural logarithm to the base e of *number*

LOG(*number,base*)
Returns the logarithm of *number* to *base*

LOG10(*number*)
Returns the logarithm to the base 10 of *number*

MOD(*numerator,denominator*)
Returns the remainder of *numerator* divided by *denominator*

PI()
Returns the approximate value of pi (π) to 14 decimal places

RAND()
Returns a random number between 0 and 1

ROUND(*number,number-of-decimals*)
Returns *number* rounded to *number-of-decimals*

ROUNDDOWN(*number,number-of-decimals*)
Returns *number* rounded down to *number-of-decimals*

ROUNDUP(*number,number-of-decimals*)
Returns *number* rounded up to *number-of-decimals*

SIGN(*number*)
Returns the sign (positive or negative) of *number*

SQRT(*number*)
Returns the square root of *number*

TRUNC(*number*)
Truncates *number* to an integer by removing the fractional part

Special-Purpose Functions

AREAS(*ref*)
Returns the number of areas in *ref*

CELL(*type-of-info,reference*)
Returns information about *reference*

CHOOSE(*index-number,list*)
Uses *index-number* to choose from *list*

COLUMN()
Returns the column number of the cell containing this function

COLUMNS(*ref*)
Returns the number of columns in *ref*

DELTA()
Returns the maximum absolute value of the changes in values between iterations

INDEX(*ref,row,column*)
Returns the cell contents of the specified row and column in the range specified by *ref*

ITERCNT()
Returns the current iteration count

LOOKUP(*search-value,table*)
Returns the item in *table* less than or equal to *search-value*

N(*ref*)
Returns the value of the cell in the upper-left corner of *ref*

NA()
Returns the error value #N/A

NAME()
Returns the filename of the worksheet

ROW()
Returns the row number of the cell containing this function

ROWS(*ref*)
Returns the number of rows in *ref*

S(*ref*)
Returns the value of the cell in the upper-left corner of *ref*, unless that cell does not contain text

VERSION()
Returns the current version number of Multiplan

Statistical Functions

AVERAGE(*list*)
Returns the average of numbers in *list*

COUNT(*list*)
Returns the count of numbers in *list*

COUNTA(*list*)
Returns the count of the non-blank cells in the list of cells

MAX(*list*)
Returns the maximum number in *list*

MIN(*list*)
Returns the minimum number in *list*

PRODUCT(*list*)
Returns the product of all the numbers in *list*

RANK(*number,ref,order*)
Returns the rank of *number* within *ref* (sorted to *order* if a range)

STDEV(*list*)
Estimates the standard deviation of numbers, based on a sample in *list*

STDEVP(*list*)
Calculates the standard deviation of numbers in *list*

SUM(*list*)
Returns the sum of numbers in *list*

VAR(*list*)
Estimates the variance of a population based on the sample in *list*

VARP(*list*)
Calculates the variance of the population in *list*

Text Functions

CHAR(*number*)
Returns the ASCII character represented by *number*

CLEAN(*text*)
Removes all non-printable characters from *text*

CODE(*text*)
Returns the ASCII code of the first character in *text*

DOLLAR(*number,number-of-decimals*)
Rounds *number* to *number-of-decimals*, and converts it to text in currency format

FIND(*find-text,within-text,start-at-num*)
Finds *find-text* within *within-text*, starting the search at the character specified by *start-at-num*

FIXED(*number,number-of-digits*)
Rounds *number* to *number-of-digits* and converts it to text in fixed format

LEFT(*text,number-of-characters*)
Returns the first *number-of-characters* in *text*

LEN(*text*)
Returns the length of *text*

LOWER(*text*)
Converts all uppercase letters in *text* to lowercase letters

MID(*text,start,number-of-characters*)
Extracts *number-of-characters* from *text,* starting at the character specified by *start*

PROPER(*text*)
Capitalizes the first letter in *text* and each letter in *text* that follows a space

REPLACE(*old-text,start-num,num-chars,new-text*)
Removes *num-chars* characters from *old-text* starting at *start-num* and replaces them with *new-text*

REPT(*text,count*)
Repeats *text count* times

RIGHT(*text,number-of-characters*)
Returns the last *number-of-characters* in *text*

SEARCH(*find-text,within-text,start-at-num*)
Searches for *find-text* within *within-text*, starting the search at the character specified by *start-at-num*

SUBSTITUTE(*text,old-text,new-text,instance-number*)
Substitutes *new-text* for *old-text* in *text*

TEXT(*number,format-string*)
Returns *number* as text, according to *format-string*

TRIM(*text*)
Removes all spaces from *text*, except for spaces between words

UPPER(*text*)
Converts all lowercase letters in *text* to uppercase letters

VALUE(*text*)
Converts *text* to a number

Trigonometric Functions

ACOS(*number*)
Returns the arccosine (in radians) of *number*

ASIN(*number*)
Returns the arcsine (in radians) of *number*

ATAN(*number*)
Returns the arctangent of *number*

ATAN2(*x-number,y-number*)
Returns the arctangent (in radians) of the x and y coordinates represented by *x-number* and *y-number*

COS(*number*)
Returns the cosine of *number* (in radians)

SIN(*number*)
Returns the sine of *number* (in radians)

TAN(*number*)
Returns the tangent of *number* (in radians)

Function Directory

The remainder of this chapter consists of a directory of function descriptions, arranged in alphabetic order. The "See Also" section at the end of each function description lists related functions.

ABS(number)

Returns the **absolute value** of *number*. An absolute value is the numeric portion of a number without the plus or minus sign.

Examples ABS(3) equals 3

ABS(–3) equals 3

See Also **MAX** for the maximum of two or more values.

MIN for the minimum of two or more values.

SIGN for the sign of a number.

ACOS(number)

Returns the arccosine of *number*. The arccosine is the angle whose cosine is *number*. *Number* must be in the range –1 to 1. The angle is given in radians in the range 0 to π.

If you want to convert the result from radians to degrees, multiply the result by 180/PI().

Examples ACOS(–0.5) equals 2.0943951 (2 π/3 radians)

ACOS(–0.5)*180/PI() equals 120 (degrees)

See Also **COS** to calculate the cosine of a number.

PI for an approximate value of π.

AND(list)

Returns the logical value TRUE if all of the specified argument values in *list* are true. Otherwise, returns FALSE.

The argument entries in *list* must be logical values. If not, the #VALUE! error value is returned.

Examples AND(TRUE(),TRUE()) equals TRUE

AND(FALSE(),FALSE()) equals FALSE

AND(FALSE(),TRUE()) equals FALSE

NOT(AND(FALSE(),TRUE())) equals TRUE

See Also **IF** to test a logical value.

NOT, OR to operate on logical values.

AREAS(ref)

Returns the number of areas in *ref*. An area is a rectangular range of contiguous cells or a single cell.

For information on using reference operators in arguments of functions (as shown in the following examples using multiple sets of parentheses), see the description of the *ref* argument in "Notation of Arguments" earlier in this chapter.

Examples If you define Cost_Region as R1C1,R2,R5 using the Name command, then:

AREAS(Cost_Region) equals 3

AREAS((Cost_Region,R10C10)) equals 4

AREAS(R1C1) equals 1

AREAS(((R2C2:R3C4,R8C9),R14C15)) equals 3

ASIN(number)

Returns the arcsine of *number*. The arcsine is the angle whose sine is *number*. *Number* must be in the range –1 to 1. The angle is given in radians in the range $-\pi/2$ to $\pi/2$.

If you want to convert the result from radians to degrees, multiply the result by 180/PI().

Examples ASIN(–0.5) equals –0.523599 ($-\pi/6$ radians)

ASIN(–0.5)*180/PI() equals –30 (degrees)

See Also **PI** for an approximate value of π.

SIN to calculate the sine of a number.

ATAN(number)

Returns the arctangent (inverse tangent) of *number*, yielding an angle in radians in the range ($-\pi/2$ to $+\pi/2$).

Examples ATAN(1) equals 0.785 ($\pi/4$ radians)

ATAN(1)*180/PI() equals 45 (degrees)

See Also **COS** to calculate the cosine of a number.

PI for an approximate value of π.

SIN to calculate the sine of a number.

TAN to calculate the tangent of a number.

ATAN2(x-number,y-number)

Returns the arctangent of the x and y coordinates represented by *x-number* and *y-number*. The arctangent is the angle from the x-axis to the coordinates *x-number*,*y-number*. The angle is given in radians in the range $-\pi$ to π, excluding $-\pi$. A positive result represents a counterclockwise angle from the x-axis; a negative result represents a clockwise angle.

If you want to convert the result from radians to degrees, multiply the result by 180/PI().

If both *x-number* and *y-number* are 0, ATAN2 returns the error value #DIV/0!.

NOTE ATAN2(*a*,*b*) equals ATAN(*b*/*a*), except that *a* can equal 0 in ATAN2.

Examples ATAN2(1,1) equals 0.7853982 ($\pi/4$ radians)

ATAN2(–1,–1) equals –2.356194 ($-3\pi/4$ radians)

ATAN2(–1,–1)*180/PI() equals –135 (degrees)

See Also **ATAN** to calculate the arctangent of an angle.

PI for an approximate value of π.

TAN to calculate the tangent of a number.

AVERAGE(list)

Calculates the average of the specified values in *list*. Returns the same result as the formula SUM(*list*)/COUNT(*list*).

At least one item in *list* must be a number. If all the items in the list are blank, Multiplan returns the error value #DIV/0!.

Example AVERAGE(1,2,3,4,5) equals 3

See Also **COUNT** to count cells containing number values.

STDEV to calculate the standard deviation of the number values.

SUM to calculate the sum of number values.

CELL(type-of-info,reference)

Returns information about the formatting, location, or contents of the upper-left cell in *reference*.

Type-of-info is a text value that specifies what type of cell information you want. If you do not supply the CELL function with *reference*, Multiplan returns the error value #REF!.

The following list shows the possible values of *type-of-info* and what they mean.

Type-of-info	CELL function returns
"width"	The column width of the cell, rounded off to an integer.
"row"	The row number in *reference*.
"col"	The column number in *reference*.
"protect"	If the cell is not locked, returns 0. If the cell is locked, returns 1.
"address"	The reference of the first cell in *reference*, as text.
"contents"	The value contained in *reference*.
"format"	A text value corresponding to the format of the cell. The following table explains the meaning of the returned text values.
"prefix"	A text value corresponding to the "label prefix" of the cell. CELL returns ' (single quotation mark) if the cell contains left-aligned text; " (double quotation mark) if the cell contains right-aligned text; ^ (caret) if the cell contains centered text; empty text (nothing) if the cell contains anything else.
"type"	A text value corresponding to the type of data in the cell. CELL returns "b" for blank if the cell is empty; "l" for label if the cell contains a text constant; "v" for value if the cell contains anything else.

The following table lists the text values that the CELL function returns for certain formats. Multiplan's built-in formats are shown, but you can create custom formats, too. You may have different built-in formats depending on the country code setting in your CONFIG.SYS file. For more information on custom formats, see Chapter 6, "Dates, Times, and Custom Formats" and "Format Cells" in Chapter 13, "Commands." For more information on country codes, see your DOS or OS/2 manual.

Format	Text returned
Default	G
@[cont]	G
0E+00	S0
0.00	F2
General	G
0	F0
$#,##0.00;($#,##0.00)	C2
BAR;(BAR)	+
0%	P0
#,##0	,0
#,##0.00	F2
$#,##0;($#,##0)	C0
0.00%	P2
0.00E+00	S2
m/d/yy	D4
m/d	D5
d-mmm-yy	D1
d-mmm	D2
mmm-yy	D3
h:mm AM/PM	D7
h:mm:ss AM/PM	D6
h:mm	D9
h:mm:ss	D8
m/d/yy h:mm	D4

Examples CELL("row",R20C1) equals 20

If R12C2 has the format "h:mm," then CELL("format",R12C2) equals D9

If R1C1 is empty, then CELL("type",R1C1) equals b

If R1C3 contains centered text, then CELL("prefix",R1C3) equals ^

See Also **AREAS** to find the number of rectangular areas in a list.

COLUMN to find the column number.

COLUMNS to find the number of columns in a particular range.

ROW to find the row number.

ROWS to find the number of rows in a particular range.

CHAR(number)

Returns the ASCII character represented by *number*.

Number can be any decimal number between 1 and 255. If it is outside this range, Multiplan returns the error value #VALUE!.

If the number is not an integer, Multiplan truncates the decimal portion. If the number is negative, Multiplan treats it as positive.

IMPORTANT If improperly used, a *number* less than 32 can be interpreted by your printer as a control character, and may cause incorrect printer results.

Examples CHAR(65) equals A

CHAR(33) equals !

See Also **CODE** for the ASCII code of a character.

CHOOSE(index-number,list)

Uses *index-number* to choose from the *list* of values. If *index-number* is 1, CHOOSE returns the first value in the list. If *index-number* is 2, CHOOSE returns the second value in the list, and so on.

If *index-number* is less than 1 or greater than the number of the last value in the list, CHOOSE returns the error value #VALUE!.

Example CHOOSE(2,"1st","2nd","3rd","Finished") equals 2nd

See Also **INDEX** to use an index to choose a value from a reference.

CLEAN(text)

Removes all non-printable characters from *text*.

Example Since CHAR(7) returns a non-printable character, CLEAN(CHAR(7)&"text"&CHAR(7)) equals "text"

See Also **CODE** for the decimal ASCII code.

TRIM to truncate a number.

CODE(text)

Returns the decimal ASCII code of the first character in *text*.

Example CODE("Alphabet") equals 65

See Also **CHAR** for the character represented by an ASCII code.

COLUMN()

Returns the number of the column in which the formula containing this function appears.

Example Place this formula in column 4:

1990+COLUMN()–4

to produce 1990 in column 4. The same formula in column 5 produces 1991. To produce a series of years (1990, 1991,...), copy the formula to the right from column 4 as many cells as the number of years you want in the series.

See Also **COLUMNS** to find the number of columns in a particular range.

ROW to find the row number.

ROWS to find the number of rows in a particular range.

COLUMNS(ref)

Returns the number of columns in *ref*.

For this function, *ref* cannot include any groups of cells separated by commas, even if extra sets of parentheses are included. For example, COLUMNS(C1:C3) is valid, but COLUMNS(C1,C3) is not, and neither is COLUMNS((C1,C3)).

Examples COLUMNS(R1C1:4) equals 4

COLUMNS(R20C1:R1C5) equals 5

See Also **COLUMN** to find the column number.

ROW to find the row number.

ROWS to find the number of rows in a particular range.

COS(number)

Returns the cosine of *number*.

Number must be an angle in radians.

Examples COS(1.0471975) equals 0.5

COS(60*PI()/180) equals 0.5

See Also **ATAN** to calculate the arctangent of a number.

PI for an approximate value of π.

SIN to calculate the sine of a number.

TAN to calculate the tangent of a number.

COUNT(list)

Counts the cells containing numbers and numeric values in *list*. All text, error, or blank values are ignored.

Example COUNT(1,2,4,Hello,17) equals 4

See Also **AVERAGE** for the average value.

SUM for the sum of a group of numbers.

COUNTA(list)

Counts the number of non-blank cells in the list of cells. If an item in the list is a reference, COUNTA ignores empty cells in the reference. This differs from COUNT in that COUNT counts only numbers and numeric values.

Examples COUNTA(1,2,3,"HELLO",5) equals 5

COUNTA("HELLO","WORLD",3) equals 3

See Also **AVERAGE** for the average value.

COUNT to calculate a count of number values.

DCOUNT to count the cells containing numbers from selected database entries.

DCOUNTA to count the non-blank cells from selected database entries.

PRODUCT to multiply numbers.

SUM to calculate the sum of number values.

DATE(year,month,day)

Gives the serial number of the date specified by *year*, *month*, and *day*.

The serial number is an integer in the range 1 to 65380, representing dates from January 1, 1900, to December 31, 2078.

Once a date is entered, the serial number appears in the cell. You must format the cell using the Format Cells command before you can see the actual date in the cell.

You can enter a date directly using the Alpha command. This entry method is more flexible because you do not have to format the date once it is entered.

Dates can be part of mathematical formulas. For example, adding 1 to a date gives the next day's date in serial number format.

Year, *month*, and *day* should make up a valid date in this range. *Year* is a number between 1900 and 2078, or 0 and 178; *month* is a number between 1 and 12; and *day* is a number between 1 and 31.

Examples DATE(1990,7,22) equals 33076

DATE(1990,9,5)–DATE(1986,6,11) equals 1547

DATE(1990,2,29) equals 32933

DATE(1990,3,1) equals 32933

See Also **DATEVALUE** to convert text to a serial number.

NOW for the serial number of the current date and time.

DATEVALUE(text)

Converts *text* to a serial number date. The date specified by *text* can be in any of Multiplan's standard date formats. The formats Multiplan considers "standard" depend on the country code setting in your CONFIG.SYS file. For more information, see "Using the International Display Option" in the "Getting Started" chapter.

Example DATEVALUE("7/8/90") equals 33062

See Also **DATE** to convert a specified year, month, and day to a serial number.

NOW for the serial number of the current date and time.

DAVERAGE(database,"field",criteria)

Averages the values in the *field* column of records in the *database* that satisfy the *criteria*.

Database must be the reference of a valid database. You can use either the range of cells or the name of the database. *Field* must be the name of a valid field in the database. *Field* must be enclosed in double quotation marks (""). *Criteria* must be the reference of a valid criteria range. You can use either the range of cells or the name of the criteria range.

Examples If "customer_db" is a named range containing the customer-order database, "Quantity" is the field containing the number of orders, and "UK_accounts" and "FR_accounts" are named ranges containing criteria to find only customers in the United Kingdom and France, then you could find the average quantity that these customers ordered in several different ways:

DAVERAGE(customer_db,"Quantity",UK_accounts)
DAVERAGE(customer_db,"Quantity",FR_accounts)
DAVERAGE(customer_db,"Quantity",R10C10:R12C12)
DAVERAGE(R40:100C1:20,"Quantity",UK_accounts)

See Also **AVERAGE** to calculate an average value.

DAY(serial-number)
MONTH(serial-number)
WEEKDAY(serial-number)
YEAR(serial-number)

These functions return portions of a date.

The functions return integers as follows:

Function	Returns
DAY	The calendar day that *serial-number* represents, in the range 1 to 31
MONTH	The calendar month that *serial-number* represents, in the range 1 to 12
WEEKDAY	The number of the weekday that *serial-number* represents, in the range 1 to 7 (where Sunday is 1 and Saturday is 7)
YEAR	The year that *serial-number* represents, in the range 1900 to 2078

Serial-number must be in the range 1 to 65380 to represent a valid date. These functions use only the integer portion of a serial number. You can also use the DATEVALUE function to compute the serial number from a date entered as text or the NOW function to return information about the current date. For more information, see Chapter 6, "Dates, Times, and Custom Formats."

Examples

DAY(DATE(1990,9,5)) equals 5

MONTH(DATE(1990,9,5)) equals 9

WEEKDAY(NOW()) equals 6 (if NOW is Friday, January 26, 1990)

YEAR(33564) equals 1991

See Also

DATE to convert a specified year, month, and day to a serial number.

DATEVALUE to convert a date entered as text to a serial number.

HOUR to convert the serial number to an hour.

MINUTE to convert the serial number to a minute.

NOW for the serial number of the current date and time.

SECOND to convert the serial number to a second.

DCOUNT(database,"field",criteria)

Counts the cells that contain numbers in the *field* column of records in the *database* that satisfy the *criteria*. DCOUNT is the database statistical equivalent of COUNT.

For a complete description of the arguments you use in database functions and some examples of how to enter these arguments, see "DAVERAGE" in this chapter.

See Also **COUNT** to count the cells containing number and numeric values.

DCOUNTA to count cells in the database that are not blank.

DCOUNTA(database,"field",criteria)

Counts the cells that are not blank in the *field* column of records in the *database* that satisfy the *criteria*. DCOUNTA is the database statistical equivalent of COUNTA.

For a complete description of the arguments you use in database functions and some examples of how to enter these arguments, see "DAVERAGE" in this chapter.

See Also **COUNTA** to count cells containing entries.

DCOUNT to count cells in the database with numbers or numeric values.

DDB(cost,salvage-value,useful-life,period,factor)

Returns depreciation of an asset for a specific period based on the asset's initial *cost*, *salvage-value* (the value of the asset at the end of its life), and *useful-life*, using *factor* for the rate at which the balance is to decline. All five arguments must be positive numbers. *Period* and *useful-life* must be given in the same units. For example, if *period* is given in months, *useful-life* must also be given in months.

The default *factor* is 2, which yields a double-declining balance. The double-declining balance method computes depreciation at an accelerated rate. Depreciation is highest in the first period and decreases in successive periods. DDB uses the formula:

((*cost* – total depreciation from prior periods)**factor*)/*useful-life*

to calculate depreciation for a period.

Example Suppose you've purchased a new sewing machine for your shoe factory. The sewing machine cost $2,400 and has a lifetime of 10 years. The salvage value of the machine is $300.

DDB(2400,300,3650,1) equals 1.32, the first day's depreciation. Multiplan automatically assumes that *factor* is 2.

DDB(2400,300,120,1,2) equals 40.00, the first month's depreciation.
DDB(2400,300,10,1,2) equals 480.00, the first year's depreciation.
DDB(2400,300,10,2,2) equals 384.00, the second year's depreciation.
DDB(2400,300,10,10) equals 22.12, the tenth year's depreciation.
Multiplan automatically assumes that *factor* is 2.

See Also **SLN** to calculate the straight-line depreciation of an asset for one period.

SYD to calculate the sum-of-years' digit depreciation of an asset for a specified period.

DELTA()

Returns the maximum absolute value of the changes in values from one iteration to the next. Returns #N/A if No is selected in the "iteration" field. Multiplan counts only the values in the cells that it evaluates between two successive DELTA functions.

DELTA returns #N/A when ITERCNT is 1 or when ISNA(ITERCNT()) returns TRUE because no previous values exist from which to calculate changes.

For more information on DELTA and iteration, see Chapter 12, "Iteration."

Example DELTA()<0.000001 returns TRUE when convergence results are less than 0.000001.

See Also **ITERCNT** for the current iteration count.

DMAX(database,"field",criteria)

Returns the largest number in the *field* column of records in the *database* that satisfies the *criteria*. DMAX is the database statistical equivalent of MAX.

For a complete description of the arguments you use in database functions and some examples of how to enter these arguments, see "DAVERAGE" in this chapter.

See Also **DMIN** to find the smallest number in a database.

MAX for the maximum of two or more values.

DMIN(database,"field",criteria)

Returns the smallest number in the *field* column of records in the *database* that satisfies the *criteria*. DMIN is the database statistical equivalent of MIN.

For a complete description of the arguments you use in database functions and some examples of how to enter these arguments, see "DAVERAGE" in this chapter.

See Also **DMAX** to find the largest number in a database.

MIN for the minimum of two or more values.

DOLLAR(number,number-of-decimals)

Converts *number* to text showing a currency amount, just as the $ format code under the Format Cells command does.

Number-of-decimals is optional. If *number-of-decimals* is omitted, *number* is rounded to two decimal places. If *number* is less than 1, a zero appears in the units position. The currency symbol displayed is determined by your country code setting. If *number* is negative, the result is enclosed in parentheses.

Examples DOLLAR(2.715) equals $2.72

DOLLAR(.15) equals $0.15

DOLLAR(0) equals $0.00

DOLLAR(–1) equals ($1.00)

See Also **FIXED** to format a number without the currency symbol.

INT to convert a number to an integer.

ROUND to round a number to a specified number of decimal places.

VALUE to change text to a number.

DPRODUCT(database,"field",criteria)

Multiplies the values in the *field* column of records in the *database* that satisfy the *criteria*. DPRODUCT is the database statistical equivalent of PRODUCT.

For a complete description of the arguments you use in database functions and some examples of how to enter these arguments, see "DAVERAGE" in this chapter.

See Also **PRODUCT** to multiply amounts.

DSTDEV(database,"field",criteria)

Estimates the standard deviation of a population based on sample data provided in the *field* column of records in the *database* that satisfy the *criteria*. DSTDEV is the database statistical equivalent of STDEV. See "STDEV" in this chapter for a more thorough explanation of standard deviation.

For a complete description of the arguments you use in database functions and some examples of how to enter these arguments, see "DAVERAGE" in this chapter.

See Also **DSTDEVP** to calculate the standard deviation from selected database entries.

STDEV to estimate the standard deviation from a sample.

DSTDEVP(database,"field",criteria)

Calculates the standard deviation of a population based on the assumption that the entire population is given in the *field* column of records in the *database* that satisfy the *criteria*. DSTDEVP is the database statistical equivalent of STDEVP. See "STDEVP" in this chapter for a more thorough explanation of standard deviation for a population.

For a complete description of the arguments you use in database functions and some examples of how to enter these arguments, see "DAVERAGE" in this chapter.

See Also **DSTDEV** to estimate the standard deviation from selected database entries.

STDEVP to calculate the standard deviation from a sample.

DSUM(database,"field",criteria)

Adds the numbers in the *field* column of records in the *database* that satisfy the *criteria*. DSUM is the database statistical equivalent of SUM.

For a complete description of the arguments you use in database functions and some examples of how to enter these arguments, see "DAVERAGE" in this chapter.

See Also **SUM** for the sum of a group of numbers.

DVAR(database,"field",criteria)

Estimates the variance of a population based on sample data provided in the *field* column of records in the *database* that satisfy the *criteria*. DVAR is the database statistical equivalent of VAR.

For a complete description of the arguments you use in database functions and some examples of how to enter these arguments, see "DAVERAGE" in this chapter.

See Also **DSTDEV** to estimate the standard deviation from selected database entries.

DVARP to calculate variance from selected database entries.

STDEV, STDEVP to calculate standard deviation.

VAR to estimate the variance for a population, based on a sample.

DVARP(database,"field",criteria)

Calculates the variance of a population based on the assumption that the entire population is given in the *field* column of records in the *database* that satisfy the *criteria*. DVARP is the database statistical equivalent of VARP.

For a complete description of the arguments you use in database functions and some examples of how to enter these arguments, see "DAVERAGE" in this chapter.

See Also **DSTDEVP** to calculate the standard deviation from selected database entries.

DVAR to estimate variance from selected database entries.

STDEV, STDEVP to calculate standard deviation.

VARP to calculate the variance for a population.

EXP(number)

Raises e to the power of *number*. The value e is 2.7182818..., the base number of natural logarithms. EXP is the inverse function of LN. You can calculate an antilog by raising e to the power of *number*.

Powers of other bases are calculated using the exponentiation operator (^).

Examples EXP(1) equals 2.7182818 (the approximate value of e)

EXP(LN(3)) equals 3

See Also **LN** for the natural logarithm of a number.

LOG10 for the base 10 logarithm of a number.

FACT(number)

Returns the factorial of *number*. The factorial of *number* is equal to

$1 \times 2 \times 3 \times \ldots \times number$

If *number* is not an integer, it is truncated.

Examples FACT(5) equals $1 \times 2 \times 3 \times 4 \times 5$ equals 120

FACT(1) equals 1

FACT(1.9) equals 1

FACT(0) equals 1 by arbitrary definition

FACT(–1) equals #NUM!

See Also **PRODUCT** to multiply numbers.

FALSE()

Returns the logical value FALSE. Use this function to test whether a condition is true or false.

Examples If R4C10 is greater than 15, then IF (R4C10>15,FALSE(),8) equals FALSE.

If R4C10 is not greater than 15, then IF (R4C10>15,FALSE(),8) equals 8.

See Also **AND, NOT, OR** to operate on logical values.

IF to test a logical value.

TRUE to return the logical value TRUE.

FIND(find-text,within-text,start-at-num)

Finds *find-text* within *within-text*, starting the search at the character specified by *start-at-num*. The first character in *within-text* is character number 1. FIND returns the number of the character at which *find-text* first occurs. If *find-text* does not appear within *within-text*, if *start-at-num* is not greater than zero, or if *start-at-num* is greater than the length of *within-text*, FIND returns the #VALUE! error value.

If you omit *start-at-num*, FIND assumes it is 1. If *find-text* is "" , FIND matches the first character that is searched (that is, the character numbered *start-at-num* or 1). FIND is case-sensitive. *Find-text* cannot contain any wildcard characters.

Examples FIND("A","Average VanGun") equals 1

FIND("a","Average VanGun") equals 5

FIND("V","Average VanGun") equals 9

FIND("v","Average VanGun") equals 2

FIND("a","Average VanGun",5) equals 5

FIND("a","Average VanGun",6) equals 10

See Also **LEN** to return the number of characters in text.

SEARCH to find specified text without checking for uppercase or lowercase.

FIXED(number,number-of-digits)

Converts *number* to text showing a fixed decimal number with the *number-of-digits*, just as the Fix format in the Format Cells command does.

If *number* is negative, a minus sign is placed before the leftmost digit. If *number-of-digits* is negative, rounding is done to the left of the decimal point.

Number-of-digits must be an integer between –30 and 30.

Example FIXED(1.12345,4) equals 1.1235

See Also **DOLLAR** to format currency amounts.

INT to convert a number to an integer value.

ROUND to round a number to a specified number of decimal places.

VALUE to convert text to a number.

FV(rate,nper,pmt,pv,time-of-pmt)

Returns the future value of an investment. For more information, see "PV" in this chapter.

HOUR(serial-number)
MINUTE(serial-number)
SECOND(serial-number)

These functions return portions of a time as integer values as follows:

Function	Returns
HOUR	The hour represented by *serial-number* in the range 0 to 23
MINUTE	The minute represented by *serial-number* in the range 0 to 59
SECOND	The second represented by *serial-number* in the range 0 to 59

The functions use only the decimal part of *serial-number* because, in serial numbers, times are represented as decimal values in the range 0 to 1, not including 1. You can also use the TIME function to compute *serial-number* from a time entered as text, or the NOW function to return information about the current time. The maximum time for any day is 23:59:59. For more information, see Chapter 6, "Dates, Times, and Custom Formats."

Examples

HOUR(0.7) equals 16

MINUTE(TIME(4,48,00)) equals 48

SECOND(NOW()) equals 26 (where NOW is 6:45:26 PM)

See Also

DAY to convert *serial-number* to a day.

MONTH to convert *serial-number* to a month.

NOW for the serial number of the current date and time.

TIME to compute *serial-number* from a specified time.

WEEKDAY to convert *serial-number* to a weekday.

YEAR to convert *serial-number* to a year.

IF(logical,value-if-true,value-if-false)

If *logical* is TRUE, returns *value-if-true*. Otherwise, returns *value-if-false*.

Value-if-true and *value-if-false* can be numeric, text, or logical values. For more information, see Chapter 7, "Conditional Formulas."

Examples If a cell named Grade equals 75, then IF(Grade>80,"Excellent",Grade) equals 75.

If Grade equals 85, then IF(Grade>80,"Excellent",Grade) equals "Excellent."

See Also **AND, NOT, OR** to operate on logical values.

FALSE, TRUE to return the logical values of FALSE and TRUE.

ISBLANK, ISERR, ISERROR, ISLOGICAL, ISNA, ISNUMBER, ISREF, ISSTRING to check for types of information.

INDEX(ref,row,column)

Returns the value in *ref* based on the values in *row* and *column*.

Row and *column* can be values or cell references containing values. If *ref* is a single row or column, the *column* or *row* argument may be omitted.

Row is relative to the top of *ref* and is not dependent on the worksheet row number. For example, if *ref* starts at row 10, and *row* is 4, Multiplan looks in the fourth row from the top of *ref*, or row 13.

Row selects a single row within *ref*. If *ref* is one row high, you can omit *row*.

Column is relative to the left side of *ref* and is not dependent on the worksheet column number. For example, if *ref* starts at column 7, and *column* is 3, INDEX looks in the third column from the left of *ref*, or column 9.

Column selects a single column within *ref*. If *ref* is one column wide, you can omit *column*.

INDEX gives the error value #VALUE! if *ref* has no cells, or if you enter a *row* or *column* number less than 1. INDEX gives the error value #REF! if a *row* or *column* number falls outside the range.

Examples Assume that the following range starts in R4C4:

	Col 4	Col 5	Col 6
Row 4	2000	0	10
Row 5	2300	0	14
Row 6	3400	154	16
Row 7	4400	314	18
Row 8	6500	692	19
Row 9	8500	1072	21

Also, assume that R4C4:R4C6 is named "Tax_row", that R4C4:R9C4 is named "Tax_col", and that the entire range, R4C4:R9C6, is named "Tax_table".

INDEX(Tax_col,4) equals 4400
INDEX(Tax_row,3) equals 10
INDEX(Tax_row,4) equals #REF!
INDEX(Tax_table,6,2) equals 1072

If R1C1 contains the numbers 10, 7, 9, 27, and 2 then:

INDEX(R1C1:R5C1,3) l3 equals 3

See Also **LOOKUP** to look up items in a table.

INT(number)

Returns the largest integer less than or equal to *number*. INT returns the same result as ROUNDDOWN(*number*,0).

Examples INT(1.1) equals 1

INT(1.99) equals 1

INT(–1.99) equals –2

INT(–0.5) equals –1

See Also **DOLLAR** to format money amounts.

FIXED to convert a number to text.

ROUND, ROUNDDOWN, ROUNDUP to round a number to a specified number of decimal places.

VALUE to convert text to a number.

IPMT(rate,period,nper,pv,fv,type)

Returns the interest payment for a specified *period* for an investment based on periodic, constant payments and a constant interest rate. The optional *fv* and *type* arguments are assumed to be zero if omitted.

The *period* must be in the range 1 to *nper*. For a complete description of the other arguments in IPMT, see the function PV later in this chapter.

NOTE In annuity functions, cash you pay out, such as a deposit to savings, is represented by a negative number; cash you receive, such as a dividend check, is represented by a positive number. For example, a $1,000 deposit to the bank would be represented by the argument –1000 if you were the depositor, and by the argument 1000 if you were the bank.

Examples The following IPMT function finds the interest due in the first month of a three-year, $8,000 loan at 10% annual interest:

IPMT(0.1/12,1,36,8000) equals –66.67

The following IPMT function finds the interest due in the last year of a three-year, $8,000 loan at 10% annual interest, where payments are made yearly:

IPMT(0.1,3,3,8000) equals –292.45

See Also **FV** to calculate the future value of an investment.

IRR to calculate the internal rate of return.

MIRR to calculate the modified internal rate of return.

NPER to calculate the number of periods (payments) for an investment.

PMT to calculate the periodic total payment for an investment.

PPMT to calculate the principal payment for an investment for a given period.

PV to calculate the present value of an investment.

RATE to calculate the interest rate per period of an investment.

IRR(ref,guess)

Calculates the internal rate of return of cash flows in *ref*. IRR is an interest rate that gives the cash flow series a net present value of zero. For this function, *ref* cannot refer to a single cell.

The value returned by IRR is calculated iteratively, and can have multiple solutions. IRR returns the error value #NUM! if the IRR calculations do not converge to within 0.0000001 within 20 iterations.

You can specify the initial value of the iteration with the optional argument *guess*. If you omit *guess*, Multiplan starts at 0.0, or 0%. Enter a different *guess* value if Multiplan cannot determine the IRR. Usually, a starting value between 0 and 1 yields a meaningful result.

You can use MIRR to produce the modified internal rate of return.

Text, logical, or blank values within *ref* are ignored.

The interest rate *guess* must be a decimal fraction.

Example You are considering an investment represented by the following cash flows entered in cells R1C1 through R1C7:

–$5,000 $1,000 $1,500 $2,000 –$3,000 $2,500 $5,000

With 10% as your *guess*, the internal rate of return of the cash flow is:

IRR(R1C1:R1C7,0.10) equals 15.05%

See Also **FV** to calculate the future value of an investment.

MIRR to calculate the modified internal rate of return.

NPV to calculate the net present value.

ISBLANK(item)

Returns TRUE if *item* is a reference to a blank cell. Otherwise, returns FALSE. Use ISBLANK in logical expressions to test for blank cells.

Examples If R1C1 is blank, then ISBLANK(R1C1) equals TRUE.

If R1C1 is not blank, then ISBLANK(R1C1) equals FALSE.

See Also **IF** to test a logical value.

ISERR, ISERROR, ISLOGICAL, ISNA, ISNUMBER, ISREF, ISSTRING to check for types of information.

ISERR(item)

Returns TRUE if *item* is any Multiplan error value except #N/A. Otherwise, returns FALSE.

Examples If R1C1 contains the error value #N/A, then ISERR(R1C1) equals FALSE.

If R1C1 contains the error value #DIV/0!, then ISERR(R1C1) equals TRUE.

See Also **IF** to test a logical value.

ISBLANK, ISERROR, ISLOGICAL, ISNA, ISNUMBER, ISREF, ISSTRING to check for types of information.

ISERROR(item)

Returns TRUE if *item* is an error value (#DIV/0!, #N/A, #NAME?, #NULL!, #NUM!, #REF!, #VALUE!). Otherwise, returns FALSE. Use ISERROR in logical expressions to test for error conditions.

Example If cell R1C1 contains the formula 3/0, then:

ISERROR(R1C1) equals TRUE

IF(ISERROR(R1C1),"Division by zero in R1C1",R1C1*3) equals "Division by zero in R1C1"

See Also **IF** to test a logical value.

ISBLANK, ISERR, ISLOGICAL, ISNA, ISNUMBER, ISREF, ISSTRING to check for types of information.

ISLOGICAL(item)

Returns TRUE if *item* is a logical value. Otherwise, returns FALSE.

Examples If R1C1 contains the logical value FALSE, then ISLOGICAL(R1C1) equals TRUE.

If R1C1 contains the number 15, then ISLOGICAL(R1C1) equals FALSE.

See Also **IF** to test a logical value.

ISBLANK, ISERR, ISERROR, ISNA, ISNUMBER, ISREF, ISSTRING to check for types of information.

ISNA(item)

Returns TRUE if *item* is #N/A (not available). Otherwise, returns FALSE. Use ISNA in logical expressions to test for data that is not available.

Example If R1C1 contains the formula N/A(), then:

ISNA(R1C1) equals TRUE

IF(ISNA(R1C1),"Value not available",R1C1*3) equals "Value not available"

See Also **IF** to test a logical value.

ISBLANK, ISERROR, ISLOGICAL, ISNUMBER, ISREF, ISSTRING to check for types of information.

NA to return #N/A.

ISNUMBER(item)

Returns TRUE if *item* is a number or blank. Otherwise, returns FALSE. Use ISNUMBER in logical expressions to test for numbers.

Examples ISNUMBER(.08) equals TRUE

ISNUMBER(TRUE()) equals FALSE

ISNUMBER("TRUE") equals FALSE

If R1C1 contains "January", then ISNUMBER(R1C1) equals FALSE.

See Also **IF** to test a logical value.

ISBLANK, ISERROR, ISLOGICAL, ISNA, ISREF, ISSTRING to check for types of information.

ISREF(item)

Returns TRUE if *item* is a reference. Otherwise, returns FALSE. Use ISREF to test whether or not a name has been defined.

Examples If Sales is a defined name, then ISREF(Sales) equals TRUE.

If Sales is not a defined name, then ISREF(Sales) equals FALSE.

See Also **IF** to test a logical value.

ISBLANK, ISERROR, ISLOGICAL, ISNA, ISNUMBER, ISSTRING to check for types of information.

ISSTRING(item)

Returns TRUE if *item* is text. Otherwise, returns FALSE.

Examples ISSTRING("word") equals TRUE

ISSTRING(4) equals FALSE

ISSTRING("4") equals TRUE

If R1C1 equals 14, then ISSTRING(R1C1) equals FALSE.

See Also **IF** to test a logical value.

ISBLANK, ISERROR, ISLOGICAL, ISNA, ISNUMBER, ISREF to check for types of information.

ITERCNT()

Returns the current iteration count, starting with 1 for the first iteration. During the first recalculation after each change to the worksheet, ITERCNT returns the #N/A error value. The ITERCNT function is especially helpful for providing initial values for iterative models, for creating a table of iteration results, and for providing a completion test.

Example To start with an initial value of 125, then switch to R3C5, use the following formula:

IF(ISNA(ITERCNT()),125,R3C5)

IF selects 125 when ITERCNT() returns the #N/A error value during the first recalculation after each change to the worksheet, making ISNA return TRUE. After that, ITERCNT returns a number, making ISNA return FALSE, so the formula selects R3C5.

See Also **DELTA** to return the maximum absolute value of the changes in value between iterations.

LEFT(text,number-of-characters)

Returns the first *number-of-characters* in *text*.

Number-of-characters must be greater than or equal to zero. If *number-of-characters* is greater than the length of *text*, the entire string is returned. The default for *number-of-characters* is 1.

Example LEFT("Paul Irving",4) equals "Paul"

See Also **RIGHT** to return specified characters from the end of a text item.

LEN(text)

Returns the number of characters in *text*.

Examples LEN("best") equals 4

MID("best",LEN("best"),1) returns the last character of the text item "best", which is "t".

See Also **LEFT** to return specified characters from the beginning of a text item.

MID to return specified characters from a text value.

RIGHT to return specified characters from the end of a text item.

LN(number)

Calculates the natural logarithm of the argument. Natural logarithms use the mathematical constant e (2.7182818...) as a base.

The LN function is the inverse of the EXP function.

Number must be positive. A #NUM! error value is returned if *number* is less than or equal to zero.

Examples LN(2.7182818) equals 1

LN(EXP(3)) equals 3

LN(8)/LN(2) equals 3 (the base logarithm of 8)

See Also **ABS** to ensure that the argument is positive.

EXP to calculate the antilog by raising e to the x power.

LOG10 for logarithms to the base 10.

LOG(number,base)

Returns the logarithm of *number* to *base*.

Number must be positive. If *base* is omitted, it is assumed to be 10.

Examples LOG(10) equals 1

LOG(8,2) equals 3

LOG(86,2.7182818) equals 4.45

See Also **EXP** to calculate the antilog by raising e to the x power.

LN for logarithms to the base e.

LOG10 for logarithms to base 10.

LOG10(number)

Calculates the base 10 logarithm of *number*. LOG10 is the inverse of base 10 exponentiation, which is the letter E in scientific notation.

Number must be positive. A #NUM! error value is returned if *number* is negative or zero.

Examples LOG10(10) equals 1

LOG10(1.00E5) equals 5

LOG10(10^7) equals 7

LOG10(8)/LOG10(2) equals 3

See Also **ABS** to ensure that the argument is positive.

EXP for the inverse of LN.

LN for logarithms to the base e and other bases.

LOOKUP(search-value,table)

Searches for the greatest value that is less than or equal to *search-value* in the first row or column of *table*. Returns the contents of a cell from the last row or column of *table*. *Table* is a group of cells on the worksheet.

The dimensions of *table* determine the direction of the search. If *table* has a number of rows greater than or equal to the number of columns, Multiplan searches the first column of *table* looking for the cell that has the largest value

less than or equal to *search-value*. If the search is successful, the value of the corresponding cell from the last column of *table* is returned. If all of the values in the first column of *table* are greater than *search-value*, #N/A is returned.

If *table* has more columns than it has rows, Multiplan searches for *search-value* in the first row of *table*.

Table must be a reference to a contiguous rectangular area in the active worksheet. *Search-value* must be numeric. The result returned may be a number value, a text value, or a logical value.

LOOKUP requires that you entered the values in the first row or column in ascending order. If values are not in ascending order, LOOKUP may return either the #VALUE! or the #N/A error value. For more information, see Chapter 8, "Tables."

Example Assume that column 1 (C1) lists base salaries, column 2 (C2) lists minimum tax, and column 3 (C3) lists marginal tax rates as percents:

C1	C2	C3
0	0	0%
2300	0	14%
3400	154	16%
4400	314	18%
6500	692	19%
8500	1072	21%

Also assume that a name "Salary" has been defined and that it contains a value, for example, 5000.

The tax on a salary in one of the brackets in the table can be expressed as:

```
LOOKUP(Salary,C1:C2)+(Salary–
LOOKUP(Salary,C1))*LOOKUP(Salary,C1:C3)
```

The first LOOKUP searches for the tax on the base amount. It finds 4400, which is the largest value less than or equal to 5000 in C1 and returns the minimum tax value 314 from C2. The second LOOKUP finds the actual base amount by searching in C1 to find the value 4400 and returning the same value (*table* can be one column wide or one row high). The third LOOKUP searches for the marginal tax rate for the amount of the salary that exceeds the base amount, and finds 4400 in C1 to return the value 18% from C3. The result is 314+(5000–4400)*18%=422.

See Also **INDEX** to find a specified entry in a table.

LOWER(text)

Converts all uppercase letters in *text* to lowercase letters.

Example LOWER("E. E. Cummings") equals "e. e. cummings"

See Also **PROPER** to convert the first letter in each word of text to uppercase.

UPPER to convert letters in text to uppercase letters.

MAX(list)

Returns the largest number value from *list*. Text, logical, or blank values are ignored. MAX returns zero if *list* contains no number values.

Example MAX(71,2,34,24,25) equals 71

"Highest of "&FIXED(COUNT(71,2,43,24,25),0)&
" is "&FIXED(MAX(71,2,34,24,25),2) equals "Highest of 5 is 71.00"

See Also **MIN** for the minimum of two or more values.

MID(text,start,number-of-characters)

Returns the specified characters from *text*.

Start specifies the starting position of the first character of *text* to be returned, counted from the left end of *text*. The first character is position 1. *Number-of-characters* specifies the number of characters to be returned. If *number-of-characters* is zero, or if *start* is greater than the length of *text*, no characters are returned. If *number-of-characters* is negative, a #VALUE! error value is returned.

Start and *number-of-characters* must be numeric values. If either *start* or *number-of-characters* has a fraction, Multiplan truncates the fraction before the integer part is used.

Examples If Grade is 1, then MID("FFFFFFDCBAA",INT(Grade/10)+1,1) equals F.

If Grade is 75, then MID("FFFFFFDCBAA",INT(Grade/10)+1,1) equals C.

If Grade is 90, then MID("FFFFFFDCBAA",INT(Grade/10)+1,1) equals A.

See Also **LEN** for the length of the text value.

MIN(list)

Returns the smallest number value from *list*. Text, logical, or blank values are ignored. MIN returns zero if *list* contains no number values.

Example MIN(71,2,43,24,25) equals 2

"Lowest of "&FIXED(COUNT(71,2,43,24,25),0)&
" is "&FIXED(MIN(71,2,43,24,25),2) equals "Lowest of 5 is 2.00"

See Also **MAX** for the maximum of two or more values.

MINUTE(serial-number)

Converts *serial-number* to a minute. For more information, see "HOUR" in this chapter.

MIRR(ref,safe,risk)

MIRR calculates the modified internal rate of return of cash flows in *ref*, given the *safe* rate returned by the investment that finances the negative cash flows, and the *risk* rate at which the positive cash flows can be reinvested. For this function, *ref* cannot refer to a single cell.

Where n is the number of cash flows in *ref*, the formula used is:

$$\text{MIRR(ref,safe,risk)} = \left(\frac{-\text{NPV(risk,list+)} \cdot (1+\text{risk})^{n}}{\text{NPV(safe,list-)} \cdot (1+\text{safe})} \right)^{\frac{1}{n-1}} - 1$$

If the three parameters for MIRR are available, you can use the result of MIRR as the initial guess for the IRR function.

Safe and *risk* are decimal fractions. They must be numeric values.

Example You are considering an investment with the following cash flows entered in cells R1C1 through R1C7:

–$5,000 $1,000 $1,500 $2,000 –$3,000 $2,500 $5,000

You plan to finance the negative cash flows with an investment earning 12%, and hope to reinvest your positive cash flows at 17%. The modified internal rate of return of the investment is given by:

MIRR(R1C1:R1C7,0.12,0.17) equals 15.19%

See Also **FV** to calculate the future value of an investment.

IRR to calculate the internal rate of return.

NPV to calculate the net present value.

MOD(numerator,denominator)

Returns the remainder (or **modulus**) after *numerator* is divided by *denominator*. The result has the same sign as *denominator*.

Both *numerator* and *denominator* must be numeric. They can be numbers or cell references. If *denominator* is zero, a #DIV/0! error value is returned.

Examples If R3C2 equals 2, then MOD(3,R3C2) equals 1.

MOD(3,–2) equals –1

MOD(6,0) equals #DIV/0!

MONTH(serial-number)

Converts *serial-number* to a month of one year. For more information, see "DAY" in this chapter.

N(ref)

Gives the value of the cell in the upper-left corner of *ref*, unless that cell does not have a numeric value. If the cell does not have a numeric value, N returns 0. N stands for "number," because the N function always returns a number or logical value. If *ref* consists of multiple ranges, then N returns the value of the cell in the upper-left corner of only the first specified range; for example, N((area2,area1)) examines only area2.

Examples If R1C1 equals 15:
N(R1C1) equals 15
N((R1C1:R3C3,R10)) equals 15

If R1C1 equals FALSE:
N(R1C1) equals 0

If R1C1 equals "Hello":
N(R1C1) equals 0

NA()

Returns the #N/A (not available) error value. Use this function with the ISNA function when preparing logical expressions for worksheets where data is not yet available.

Example You are computing increases in departmental expenses, but the inflation figure that goes into cell R8C12 is not available. You can construct the worksheet to reflect this.

If R8C12 is NA(), and R19C43 computes total expenses times inflation:

IF(ISNA(R8C12),"Inflation %",R19C43*R8C12) equals "Inflation %"

See Also **ISNA** to test for the #N/A error value.

NAME()

Returns the filename of the worksheet.

Example If the worksheet is saved on drive C in the \MP\JVH directory with the filename BUDGET.JVH, then NAME() equals "BUDGET.JVH".

See Also **LEFT** to return specified characters from the beginning of a text item.

LEN to return the number of characters in a text value.

MID to return specified characters from a text value.

RIGHT to return specified characters from the end of a text item.

NOT(logical)

Returns the opposite of the value of *logical* (FALSE if the argument is TRUE; TRUE if the argument is FALSE).

Examples

NOT(OR(FALSE(),FALSE())) equals TRUE

NOT(AND(FALSE(),FALSE())) equals TRUE

NOT(OR(FALSE(),TRUE())) equals FALSE

See Also

AND, OR to operate on logical values.

IF to test a logical value.

NOW()

Returns a serial number representing the current date and time, as kept by your computer's system clock. The serial number is updated at every recalculation.

The serial number has an integer part and a decimal part. The integer part of the serial number is in the range 1 to 65380, representing dates from January 1, 1900, to December 31, 2078. The decimal part is in the range 0 to 0.999, representing times from 0:00:00 or 12:00:00 A.M. (midnight) to 23:59:59 or 11:59:59 P.M.

Use the Format Cells command to format the cell containing the serial number to show date, time, or both.

Example

If the date and time are July 28, 1990, 9:30 A.M., then:

NOW() equals 33082.3958333333

See Also

DAY to convert the serial number to a day.

HOUR to convert the serial number to an hour.

MINUTE to convert the serial number to a minute.

MONTH to convert the serial number to a month.

SECOND to convert the serial number to a second.

WEEKDAY to convert the serial number to a weekday.

YEAR to convert the serial number to a year.

NPER(rate,pmt,pv,fv,time-of-pmt)

Returns the number of payments for an investment. For more information, see "PV" in this chapter.

NPV(rate,list)

Calculates the net present value of a future cash flow series discounted at a constant interest rate represented by *rate*.

The formula used is:

$$\sum_{i=1}^{n} \frac{\text{list}_i}{(1+\text{rate})^i}$$

Multiplan assumes that cash transactions occur at equal intervals, with the first transaction occurring at the end of the first period. To find the net present value of a series whose first transaction occurs at the beginning of the first period, you must add the first transaction to the net present value of the subsequent transactions.

The future cash flow series is represented by *list*. The items in *list* can be numbers, cells, or ranges. Multiplan ignores text, logical, and blank cells. The first value represented by *list* is income required at the end of the first period, the second is the income required at the end of the next period, and so on.

Rate is an interest rate, expressed as a decimal fraction (0.11 is a rate of 11%). It must be numeric. *Rate* usually ranges from 0 to 1.

Example

You are given the opportunity to lease a parking lot for five years for an $80,000 one-time payment. The lot currently generates $15,000 net operating income annually. Based on research and profit studies you have done, your opportunity rate is 15% and you expect the income to increase 30% annually.

Set up the example like this:

1. Enter the value $15,000 in R1C1.
2. Enter the formula R[–1]C*1.3 in R2C1:R5C1.
3. Name R1C1:R5C1 "Flow."

You can now figure the net present value of the cash flow:

▶ Enter the formula NPV(15%,Flow) in R6C1.

This gives you the net present value, $84,598.24. Since this is greater than the cost of the lease, you can conclude that it is a worthwhile investment.

See Also

FV to calculate the future value of an investment.

IRR to calculate the internal rate of return.

MIRR to calculate the modified internal rate of return.

OR(list)

Returns the logical value TRUE if any value in *list* is true. Otherwise, returns FALSE.

List must contain only logical values. If not, the #VALUE! error value is returned.

Examples

OR(TRUE(),TRUE()) equals TRUE

OR(TRUE(),FALSE()) equals TRUE

OR(FALSE(),FALSE()) equals FALSE

NOT(OR(FALSE(),FALSE())) equals TRUE

See Also

AND, NOT to operate on logical values.

IF to test a logical value.

PI()

Returns the value 3.14159265358979, an approximation of the mathematical constant π.

Example

ATAN(1)*180/PI() equals 45 (degrees)

See Also

ATAN to calculate an arctangent.

COS to calculate a cosine.

SIN to calculate a sine.

TAN to calculate a tangent.

PMT(rate,nper,pv,fv,time-of-pmt)

Returns the periodic payment for an investment. For more information, see "PV" in this chapter.

PPMT(rate,period,nper,pv,fv,type)

Returns the payment on the principal for a given *period* for an investment based on periodic, constant payments and a constant interest rate. The optional *fv* and *type* arguments are assumed to be 0 if omitted.

The *period* must be in the range 1 to *nper*. For a complete description of the other arguments in PPMT, see the description of the PV function in this chapter.

NOTE In annuity functions, cash paid out, such as a deposit to savings, is represented by a negative number; cash received, such as a dividend check, is represented by a positive number. For example, a $1,000 deposit to the bank would be represented by the argument –1000 if you were the depositor, and by the argument 1000 if you were the bank.

Examples The following PPMT function finds the principal payment for the first month of a two-year, $2,000 loan at 10% annual interest:

PPMT(0.1/12,1,24,2000) equals –75.62

The following PPMT function finds the principal payment for the last year of a 10-year, $200,000 loan at 8% annual interest:

PPMT(0.08,10,10,200000) equals –27598.05

See Also **FV** to calculate the future value of an investment.

IPMT to calculate the interest payment.

IRR to calculate the internal rate of return.

MIRR to calculate the modified internal rate of return.

NPER to calculate the number of periods (payments) for an investment.

PMT to calculate the periodic payment for an investment.

PV to calculate the present value of an investment.

RATE to calculate the interest rate per period of an investment.

PRODUCT(list)

Multiplies all the numbers in the *list* and returns the product. The *list* can contain only numbers, logical values, text representations of numbers, or blank cells. Cells containing error values or text will produce an error.

Examples PRODUCT(2,3,4) equals 24

If R1C1 contains 5 and R2C1 contains 2, then PRODUCT(R1C1:R2C1) equals 10.

See Also **FACT** to calculate the factorial of a number.

SUM for the sum of a group of numbers.

PROPER(text)

Capitalizes the first letter in *text* and any letter in *text* that follows a space. Converts all other letters to lowercase. This function ignores characters that aren't letters. For example, in the text string "2-cents' worth", it ignores the "2-" and produces the result "2-Cents' Worth".

Example PROPER("this is a TITLE") equals "This Is A Title"

See Also **LOWER** to convert all letters in a text item to lowercase.

UPPER to convert all letters in a text item to uppercase.

PV(rate,nper,pmt,fv,time-of-pmt)
FV(rate,nper,pmt,pv,time-of-pmt)
NPER(rate,pmt,pv,fv,time-of-pmt)
PMT(rate,nper,pv,fv,time-of-pmt)
RATE(nper,pmt,pv,fv,time-of-pmt,guess)

These functions apply to an **annuity**. An annuity is a series of level cash payments made over a continuous period of time. For example, a car loan is an annuity.

Multiplan uses the following equations to solve for one financial argument in terms of the others:

$$pv \cdot (1+rate)^{nper} + pmt \cdot (1+rate \cdot t) \frac{(1+rate)^{nper} - 1}{rate} + fv = 0 \quad i <> 0$$

for rates not equal to zero, and:

$$pv \cdot (1+rate)^{nper} + pmt \cdot (1+rate \cdot t)\ nper + fv = 0 \qquad i = 0$$

for rates equal to zero.

Rate is based on an annual rate, but is expressed as a periodic interest rate within a formula. For example, if you get a car loan at a 10% annual interest rate and make monthly payments, your monthly periodic interest rate is 10%/12, or .83%. You would enter either .83% or .0083 into the formula as *rate*.

Nper (number of periods) represents the total number of payment periods in a loan, assuming the loan is not paid off early or extended. For example, if you get a four-year car loan and make monthly payments, your loan has 48 periods. You would enter 48 into the formula as the number of periods (*nper*).

Pmt (payment) is the level amount paid each period. It contains only principal and interest and does not include taxes or insurance. For example, the monthly payments on a $10,000, four-year car loan at 12% are $263.33. You would enter 263.33 into the formula as *pmt*.

Pv (present value) is the lump sum amount you would be willing to pay someone today for a series of payments (annuity) to be paid to you in the future. For example, when you borrow money to buy a car, the lender sees the loan amount as the present value of the monthly car payments you will make.

Fv (future value) represents a cash balance you want to attain sometime in the future by making steady cash payments. For example, if you think you will need $50,000 in 18 years to pay for your child's education, then $50,000 is the *fv*. You could then determine how much you must save each month based on a realistic interest rate.

Cash Flow Conventions

Pv and *pmt* numbers must follow cash flow conventions: cash you pay out, such as deposits to savings, is represented by negative numbers; cash you receive, such as dividend checks, is represented by positive numbers.

If you omit *pv*, it is assumed to be zero. The optional argument *time-of-pmt* in each function allows you to specify whether payments are made at the beginning or end of the periods. If *time-of-pmt*=0, payments are made at the end; if *time-of-pmt*=1, payments are made at the beginning. The default value is *time-of-pmt*=0.

Multiplan uses an iterative technique to compute *rate*, which can have zero, one, or two solutions. If convergence to within 0.0000001 does not occur within 20 iterations, the function returns the error value #NUM!. You can specify the initial value of the iteration with the optional argument *guess*. The default value is *guess*=0. If the rate does not converge, try different values for *guess*. Usually, an initial value between 0 and 1 yields a meaningful result.

Rate and *guess* must be decimal fractions. All arguments for these functions must be numeric.

Examples

Example 1: An insurance company wants to sell you an annuity that pays $500 at the beginning of every month for the next 20 years. They promise you an 8% interest rate and the cost of the annuity is $60,000. Should you buy it?

PV(.08/12,12*20,500,0,0) equals –$59,777

The answer is no. Using the PV function, you discover that the present value of the annuity is $223 less than the purchase price.

Example 2: What is the monthly payment on a $12,000 loan at 9% annual interest, if the loan is to be paid off in 2 years?

You have received a loan of $12,000 (*pv*), at a monthly interest rate of 0.75% (*rate*), and must pay off the loan in 24 (*nper*) monthly payments made at the end of each month (*time-of-pmt*=0). The monthly payment is given by:

PMT(0.0075,24,12000) equals –$548.22

Example 3: A limited partnership plans to buy an apartment building for $750,000 with the expectation of selling the building for $1,500,000 in six years. If the rent from the apartments amounts to $100,000 annually, what annual rate of return will the investment yield?

You pay –$750,000 (*pv*) at the beginning of the investment, receive $100,000 (*pmt*) at the end of each year (*time-of-pmt*=0) for the next 6 (*nper*) years, and receive another $1,500,000 (*fv*) at the end of the investment. With 10% as your initial *guess* at the annual rate of return, the annual rate of return on the investment is given by:

RATE(6,100000,–750000,1500000,0,0.10) equals 22.73%

Example 4: Suppose you now have $1,000 in your savings account earning 6% annual interest (0.5% monthly interest), and you plan to deposit $100 at the beginning of every month for the next 12 months. How much will you have in your savings account at the end of the 12 months?

You have already deposited –$1,000 (*pv*) in an account earning 0.5% (*rate*) monthly interest, and you will deposit an additional –$100 (*pmt*) at the beginning of every month (*time-of-pmt*=1) for the next 12 (*nper*) months. The future value of your account at the end of the 12 months is given by:

FV(.5%,12,–100,–1000,1) equals 2301.40

See Also **IRR** to calculate the internal rate of return.

MIRR to calculate the modified internal rate of return.

RAND()

Gives a random number in the range 0 to 0.999…. A new random number is generated every time Multiplan recalculates.

Example RAND() equals .39540, but only this time because the result is random.

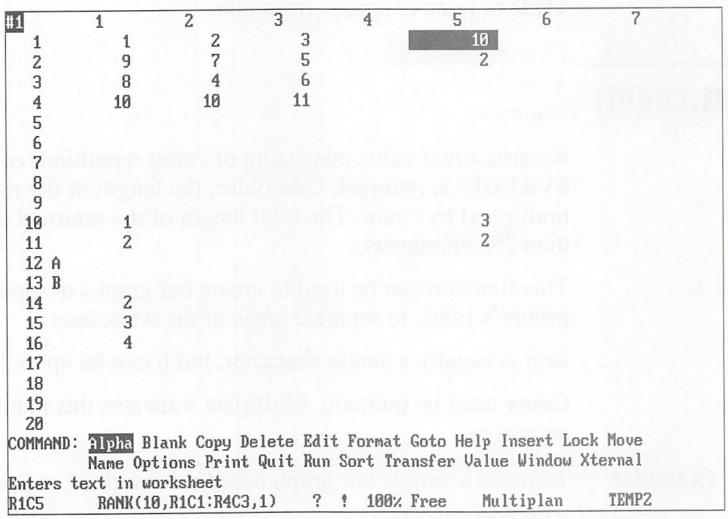
RANK(number,ref,order)

Returns the rank of *number* within the *ref* (sorted according to *order*).

The rank of *number* is its size relative to the other values in *ref*. If you were to sort *ref* by size, the rank of *number* would be its position in the sorted list. If *order* is 0, Multiplan ranks *number* as if *ref* were a list sorted in descending order. If *order* is not 0, Multiplan ranks *number* as if *ref* were a list sorted in ascending order.

The RANK function gives duplicate values the same rank. For example, in the following worksheet, RANK (10,R1C1:R4C3,1) equals 10 even though 10 is listed twice in the reference. The presence of duplicate values can affect the rank of other values, however. For example, RANK(11,R1C1:R4C3,1) equals 12, not 11, since 10 is duplicated. The RANK function ignores text (alphas).

Examples



For the preceding worksheet:

RANK(10,R1C1:R4C3,0) equals 2
RANK(10,R1C1:R4C3,1) equals 10
RANK(11,R1C1:R4C3,1) equals 12
RANK(3,R10C1:R16C1,0) equals 2
RANK(3,R10C1:R16C1,1) equals 4

RATE(nper,pmt,pv,fv,time-of-pmt,guess)

Calculates the rate returned for an investment. For more information, see "PV" in this chapter.

REPLACE(old-text,start-num,num-chars,new-text)

Removes *num-chars* characters from *old-text* starting at *start-num* and replaces them with *new-text*. The first character in the text is numbered 1.

Examples REPLACE("abcde",1,1,"x") equals "xbcde"

REPLACE("abcde",3,2,"x") equals "abxe"

See Also **SUBSTITUTE** to replace specific characters within text.

TRIM to remove spaces from text.

REPT(text,count)

Returns a text value consisting of *count* repetitions of *text*. If *count* is negative, #VALUE! is returned. Otherwise, the length of the result is the length of *text* multiplied by *count*. The total length of the returned text value must be shorter than 256 characters.

This function can be used to create bar graphs or repeating patterns, such as printer's rules, to separate areas of the worksheet.

Text is usually a single character, but it can be up to 245 characters.

Count must be numeric. Multiplan truncates this number to an integer if necessary.

Examples To make a simple bar graph based on one-third of Score:

REPT("+",Score/3)

If you want to enter repeating text in a cell, such as a line of hyphens:

REPT("-",10)

The status line shows this formula in the cell. Now press A (for Alpha), and then press Enter. Multiplan converts the information to text (in this case, a line of hyphens). The status line now shows a line of hyphens instead of a formula.

RIGHT(text,number-of-characters)

Returns the last *number-of-characters* in *text*. *Number-of-characters* must be greater than or equal to zero. If *number-of-characters* is greater than the length of *text*, the entire string is returned. The default for *number-of-characters* is 1.

Example RIGHT("Paul Irving",6) returns "Irving"

See Also **LEFT** to return specified characters from the beginning of a text item.

ROUND(number,number-of-decimals)

Rounds *number* to *number-of-decimals*.

Number-of-decimals specifies the rounding as follows:

- If *number-of-decimals* is greater than zero, then the result is rounded to that many decimal places. For example, ROUND(3.1416,3) produces 3.142.
- If *number-of-decimals* is zero, the result is rounded to an integer.
- If *number-of-decimals* is negative, rounding is carried out on the integer. For example, ROUND(21,–1) produces 20 while ROUND(991,–2) produces 1000.

Number and *number-of-decimals* must be numeric.

Examples ROUND(2.15,1) equals 2.2

ROUND(2.149,1) equals 2.1

ROUND(–1.475,2) equals –1.48

See Also **DOLLAR** to format currency amounts.

FIXED to format a number with the currency symbol.

INT to convert a decimal number to an integer.

VALUE to convert text to a numeric value.

ROUNDDOWN(number,number-of-decimals)

Rounds *number* down to *number-of-decimals*.

Number-of-decimals specifies the rounding as follows:

- If *number-of-decimals* is greater than zero, then the result is rounded down to that many decimal places. For example, ROUNDDOWN(3.1416,3) produces 3.141.
- If *number-of-decimals* is zero, the result is rounded down to an integer.
- If *number-of-decimals* is negative, rounding down is carried out on the integer.

ROUNDDOWN always rounds toward negative infinity.

Examples

ROUNDDOWN(31.499,1) equals 31.4

ROUNDDOWN(41.8,0) equals 41

ROUNDDOWN(22,–1) equals 20

ROUNDDOWN(991,–2) equals 900

ROUNDDOWN(–31.4,0) equals –32

ROUNDDDOWN(–31.4,–1) equals –40

ROUNDDOWN(–31.45,–2) equals –100

ROUNDDOWN(–31.45,–3) equals –1000

The last four examples particularly show how ROUNDDOWN rounds negative numbers toward negative infinity.

See Also

DOLLAR to format currency amounts.

FIXED to format a number with the currency symbol.

INT to convert a decimal number to an integer.

ROUND to round numbers up and down.

ROUNDUP to round numbers up.

VALUE to convert text to a numeric value.

ROUNDUP(number,number-of-decimals)

Rounds *number* up to *number-of-decimals*.

Number-of-decimals specifies the rounding as follows:

- If *number-of-decimals* is greater than zero, then the result is rounded up to that many decimal places. For example, ROUNDUP(3.1416,3) produces 3.142.
- If *number-of-decimals* is zero, the result is rounded up to an integer.
- If *number-of-decimals* is negative, rounding up is carried out on the integer.

ROUNDUP always rounds toward positive infinity.

Examples

ROUNDUP(31.499,1) equals 31.5

ROUNDUP(41.8,0) equals 42

ROUNDUP(21,–1) equals 30

ROUNDUP(991,–2) equals 1000

ROUNDUP(–31.4,0) equals –31

ROUNDUP(–31.4,–1) equals –30

ROUNDUP(–31.45,–2) equals 0

ROUNDUP(–31.45,–3) equals 0

See Also

DOLLAR to format currency amounts.

FIXED to format a number with the currency symbol.

INT to convert a decimal number to an integer.

ROUND to round numbers up and down.

ROUNDDOWN to round numbers down.

VALUE to convert text to a numeric value.

ROW()

Returns the number of the row in which the formula containing the ROW function appears.

Example Copying the expression ROW()*10 throughout the first column, starting at row 1, creates the sequence of numbers:

10

20

30

and so on.

See Also **COLUMN** for the current column number.

ROWS(ref)

Returns the number of rows in *ref*.

For this function, *ref* cannot include any groups of cells separated by commas, even if extra sets of parentheses are included. For example, ROWS(R1:R3) is valid, but ROWS(R1,R3) and ROWS((R1,R3)) are not.

Examples ROWS(R1C1:4) equals 1

ROWS(R20C1:R1C5) equals 20

S(ref)

Gives the value of the cell in the upper-left corner of *ref*, unless that cell does not contain text. If that cell does not contain text, S returns " ". If *ref* consists of multiple ranges, then S returns the value of the cell in the upper-left corner of only the first specified range; for example, S((area2,area1)) examines only area2.

Examples If R1C1 is "Hello", then:
S(R1C1) equals "Hello"
S((R1C1:R3C3,R10)) equals "Hello"

If R1C1 is TRUE, then:
S(R1C1) equals " "

If R1C1 is 210, then:
S(R1C1) equals " "

See Also **N** for the value of a cell that contains a numeric value.

SEARCH(find-text,within-text,start-at-num)

Searches for *find-text* within *within-text*, starting the search at the character specified by *start-at-num*. The first character in *within-text* is character number 1. SEARCH returns the number of the character at which *find-text* first occurs. If *find-text* does not appear within *within-text*, if *start-at-num* is not greater than zero, or if *start-at-num* is greater than the length of *within-text*, SEARCH returns the error value #VALUE!.

If you omit *start-at-num*, SEARCH assumes it is 1. If *find-text* is "" , SEARCH matches the first character that is searched (that is, the character numbered *start-at-num*, or 1).

SEARCH does not distinguish between uppercase and lowercase letters.

Examples SEARCH("e","Beautiful Noise") equals 2

SEARCH("E","Beautiful Noise",2) equals 2

SEARCH("","Beautiful Noise") equals 1

See Also **FIND** to find uppercase or lowercase text.

LEN to return the number of characters in text.

SECOND(serial-number)

Converts *serial-number* to a second. For more information, see "HOUR" in this chapter.

SIGN(number)

Returns a number representing the algebraic sign of *number*.

If the sign of *number* is positive, SIGN returns 1. If *number* is zero, SIGN returns 0. If the sign of *number* is negative, SIGN returns –1.

Examples SIGN(100) equals 1

SIGN(–100) equals –1

To display the magnitude of the number in R1C1 in bar chart form with its sign:

REPT(MID("– +",SIGN(R1C1)+2,1),ABS(R1C1))

NOTE Be sure to include the space between the – and the + signs in the last example.

See Also **ABS** to return the absolute value of a number.

SIN(number)

Calculates the sine of *number*. *Number* is an angle in radians.

Examples SIN(1.047) equals 0.866

SIN(60*PI()/180) equals 0.866

See Also **ATAN** to calculate an arctangent.

COS to calculate a cosine.

PI for an approximation of π.

TAN to calculate a tangent.

SLN(cost,salvage-value,useful-life)

Returns the straight-line depreciation of an asset for a single period. The following list describes the arguments:

Argument	Description
cost	Initial cost of the asset
salvage-value	Value at the end of the depreciation
useful-life	Number of periods over which the asset is being depreciated

Example If you've bought a truck for $30,000 that has a *useful-life* of 10 years and a *salvage-value* of $7,500, the yearly depreciation allowance for the first year is given by:

SLN(30000,7500,10) equals 2250

See Also **DDB** to calculate the depreciation of an asset for a specified period, using the double-declining balance method.

SYD to calculate the depreciation of an asset for a specified period, using the sum-of-years' digits method.

SQRT(number)

Returns the square root of *number*.

Number must be positive. If *number* is negative, the #NUM! error value is returned.

Examples SQRT(9) equals 3

SQRT(–9) equals #NUM!

See Also **ABS** to calculate the absolute value of a number.

STDEV(list)

Estimates the standard deviation for a population based on the sample values in *list* according to the formula:

$$s = \sqrt{\frac{\sum x^2 - \frac{(\sum x)^2}{n}}{n - 1}}$$

The standard deviation is a measure of how widely values are dispersed from the average value (the mean).

Example Ten tools stamped from the same machine during a production run are collected as a random sample and measured for breaking strength. The sample values are 1345, 1301, 1368, 1322, 1310, 1370, 1318, 1350, 1303, and 1299 kilograms. The sample values are placed in cells R2C1:R3C5. STDEV estimates the standard deviation of breaking strengths for all the tools.

STDEV(R2C1:R3C5) equals 27.46

See Also **AVERAGE** for the average value.

STDEVP(list)

Calculates the standard deviation of a population based on the assumption that *list* contains values for the entire population. All text, logical, or empty cell values are ignored.

STDEVP uses the following formula:

$$= \sqrt{\frac{n\Sigma x^2 - (\Sigma x)^2}{n^2}}$$

NOTE STDEVP assumes that its arguments are the entire population. If your data represent a sample of the population, you should compute the standard deviation using STDEV. For large sample sizes, STDEV and STDEVP return approximately equal values.

Example Using the same data from the previous example given for STDEV, assume that only 10 tools are produced during the entire production run.

STDEVP(R2C1:R3C5) equals 26.05

See Also **DSTDEVP** to calculate the standard deviation from selected database entries.

STDEV to estimate the standard deviation from a sample.

VAR, VARP to calculate variance.

SUBSTITUTE(text,old-text,new-text,instance-number)

Substitutes *new-text* for *old-text* in *text*. If you specify *instance-number*, only that instance of *old-text* is replaced. Otherwise, every *old-text* in *text* is changed to *new-text*.

Examples SUBSTITUTE("waffles","f","d") equals "waddles"

SUBSTITUTE("Ann And Nick","An","Da",1) equals "Dan And Nick"

SUBSTITUTE("Ann And Nick","An","Da",2) equals "Ann Dad Nick"

SUBSTITUTE("Ann And Nick","An","Da") equals "Dan Dad Nick"

SUBSTITUTE("hi de hi","hi","ho",2) equals "hi de ho"

See Also **REPLACE** to substitute characters within text from a specified starting point.

TRIM to remove spaces from text.

SUM(list)

Adds the numbers in *list*.

Example If the first five cells in row 1 contain 1 through 5, respectively, then SUM(R1C1:R1C5) equals 15.

See Also **AVERAGE** to calculate the average value.

COUNT to count the number of numeric values.

MAX for the maximum of two or more values.

MIN for the minimum of two or more values.

SYD(cost,salvage-value,useful-life,period)

Returns the sum-of-years' digits depreciation for an asset for a specified period. The following list summarizes the arguments:

Argument	Description
cost	Initial cost of the asset
salvage-value	Value at the end of the depreciation
useful-life	Number of periods over which the asset is being depreciated
period	Period (must use same units as *useful-life*)

Example If you've bought a truck for $30,000 that has a useful life of 10 years and a salvage value of $7,500, the yearly depreciation allowance for the first year is given by:

SYD(30000,7500,10,1) equals 4090.91

The yearly depreciation allowance for the tenth year is given by:

SYD(30000,7500,10,10) equals 409.09

See Also **DDB** to calculate the depreciation for an asset for a specified period, using the double-declining balance method.

SLN to calculate the straight-line depreciation of an asset for one period.

TAN(number)

Calculates the tangent of *number*. *Number* is an angle in radians.

Examples TAN(0.785) equals 1

TAN(45*PI()/180) equals 1

See Also **ATAN** to calculate the arctangent of a number.

COS to calculate the cosine of a number.

PI for an approximation of π.

SIN to calculate the sine of a number.

TEXT(number,format-string)

Formats *number* according to *format-string*, and returns the result as text.

Format-string can be any text that you type in the "format" field of the Format Cells command, except "Default", "@[cont]", or "Ignored." For more information on the Format Cells command, see "Format Cells" in Chapter 13, "Commands."

NOTE The major difference between formatting a cell containing a value with the Format Cells command and formatting a value directly with TEXT is that TEXT converts its result to text. A number formatted with the Format Cells command is still a number.

Examples TEXT(2.715,"$#,##0.00") equals "$2.72"

TEXT(NOW(),"yyyy") equals the current year; for example, in 1990, it would return the text value "1990".

TIME(hour,minute,second)

Gives the serial number of the time specified by *hour*, *minute*, and *second*.

The serial number for time is a decimal value in the range 0 to 1, not including 1, representing times from 0:00:00 or 12:00:00 A.M. (midnight) to 23:59:59 or 11:59:59 P.M. *Hour*, *minute*, and *second* must form a valid time in this range.

You can also enter the time into a cell by using the Alpha command. Multiplan can automatically convert times to serial numbers. For more information on entering times, see Chapter 6, "Dates, Times, and Custom Formats."

Examples TIME(12,0,0) equals 0.5

TIME(16,48,0)–TIME(12,0,0) equals 0.2

See Also **DATE** to calculate the serial number of the date from the year, month, and day.

NOW for the serial number of the current date and time.

TIMEVALUE to convert text to a time serial number.

TIMEVALUE(text)

Converts *text* to a serial time number. The time specified by *text* can be in any of Multiplan's standard time formats. The formats that Multiplan considers "standard" depend on the country code setting in your CONFIG.SYS file.

Example TIMEVALUE("2:24 AM") equals 0.1

See Also **DATE** to calculate the serial number of the date from the year, month, and day.

NOW for the serial number of the current date and time.

TIME to convert the hour, minute, and second to a time serial number.

TRIM(text)

Removes all spaces from *text*, except for one space between each two words.

Example TRIM(" A B C") equals "A B C"

TRUE()

Enters the logical value TRUE in a cell. Use this function to test whether a condition is true or false.

Examples If R4C10 is greater than 15, then IF(R4C10>15,TRUE(),8) equals TRUE.

If R4C10 is not greater than 15, then IF(R4C10>15,TRUE(),8) equals 8.

See Also **AND, NOT, OR** to operate on logical values.

FALSE to return a value of FALSE.

IF to test a logical value.

TRUNC(number)

Truncates *number* to an integer by removing the fractional part.

Examples TRUNC(8.9) equals 8

TRUNC(–8.9) equals –8

See Also **INT** to return the largest integer less than or equal to a number.

MOD to return the remainder from division.

ROUND to round a number to a specified number of digits.

UPPER(text)

Converts all lowercase letters in *text* to uppercase letters.

Example UPPER("Oh, yeah?") equals "OH, YEAH?"

See Also **LOWER** to convert text to all lowercase letters.

PROPER to convert the first letter of each word to uppercase.

VALUE(text)

Returns a numeric value represented by *text*.

Text must be the text form of a number, similar to those produced by the formatting codes used by Multiplan. It may contain a leading currency symbol or a leading minus sign. It may be written in scientific notation.

For example, all the following text forms yield the value 10: 10, $10.00, 1E1. The following text forms yield negative 10: –10, –1E1.

If the contents of *text* do not describe a number—if they include letters, for instance, or two decimal points—a #VALUE! error value is returned. You can avoid this problem by first isolating numbers mixed with non-numeric characters, as shown in the example.

Example If R1C1 contains the text "3/21/90" then VALUE(MID(R1C1,3,2)) equals 21.

See Also **DOLLAR** to format currency amounts.

FIXED to format a number with the currency symbol.

INT to convert a decimal number to an integer.

ROUND to round a number to a specific number of decimal places.

VAR(list)

Estimates the variance of a population based on the sample in *list*.

NOTE VAR assumes that its arguments are a sample of the population. If your data represent the entire population, you should calculate the variance using VARP.

All text, logical, or empty cell values are ignored.

VAR uses the following formula:

$$\frac{n\Sigma(x^2)-(\Sigma x)^2}{n(n-1)}$$

Example

#1	1	2	3	4	5	6	7
1	February	March	April	May	June	July	
2	5	15	30	40	50		
3							
4							

In the worksheet above, VAR(R2C1:R2C5) equals 332.5

See Also **DVAR** to estimate variance from selected database entries.

STDEV, STDEVP to calculate standard deviation.

VARP to calculate the variance for a population.

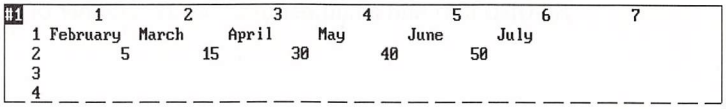
VARP(list)

Calculates the variance of a population based on the assumption that *list* contains the entire population.

NOTE VARP assumes that its arguments are the entire population. If your data represent a sample of the population, you should compute the variance using VAR.

All text, logical, or empty cell values are ignored.

Example



	1	2	3	4	5	6	7
1	February	March	April	May	June	July	
2	5	15	30	40	50		
3							
4							

In the worksheet above, VARP(R2C1:R2C5) equals 266

See Also

DVAR to estimate variance from selected database entries.

STDEV, STDEVP to calculate standard deviation.

VAR to estimate the variance from a sample.

VERSION()

Returns the current version number of Multiplan, with up to two decimal places depending on the cell format.

If the version is 4.2 and the cell is formatted for one decimal place, then: VERSION() equals 4.2

WEEKDAY(serial-number)

Converts *serial-number* to a day of the week. For more information, see "DAY" in this chapter.

YEAR(serial-number)

Converts *serial-number* to a year. For more information, see "DAY" in this chapter.

15 Messages

This chapter lists, in alphabetical order, some of the messages that you might encounter when using Multiplan, along with descriptions of possible causes and what actions you can take in response to them. Not all of Multiplan's messages are listed here.

Bad command or filename

- *DOS could not carry out the command you typed after choosing the Run command.*

  Check the spelling of the command or be sure you've included the complete drive name and directory path of the command if it is not included in the DOS command search path.

Can only audit cells with formulas

- *You chose the Run Audit Formulas command to audit a cell that does not contain a formula.*

  Either choose the Run Audit Cells command, or move the cell pointer to the correct cell and try again.

Cannot add format

- *You have already added the maximum number of custom formats (64).*

  Use an existing format, or delete a format by choosing the Format Replace command and replacing the format with NONE.

Cannot copy into non-blank cell

- *The destination area of an External Copy command contains a non-blank cell.*

  Review the response to the External Copy command. Make sure that the destination area you specify is not used for any other purpose. If appropriate, clear the cells that are not blank.

Cannot link those windows

- *You tried to link two windows for scrolling that were not split from each other, or that contain different worksheets. This message may also occur when unlinking, especially when unlinking a title split.*

  Check to be sure that the windows you are attempting to link share a window split relationship. You cannot unlink windows that are split with the Window Split Titles command.

Cannot load driver

- *You specified a printer driver, but Multiplan could not load it.*

  Check to be sure that you typed the name of the printer driver correctly. Also check that the printer driver is in the directory you specified.

Cannot read file

- *Confirms a negative response to the* Enter Y to retry access to *message. Appears whenever Multiplan cannot read a file for reasons such as incorrect filename, damaged file, wrong drive, or wrong directory.*

  No special action is necessary. For more information, see "Problems with File Access" in Appendix C, "Tips and Additional Information About Multiplan."

Cannot write file

- *The file you named is available but cannot be written because the disk is full, the disk or file is write-protected, there is no disk in the drive, or the disk is not formatted.*

  First, save your work on a different disk. Check the available space and write-protection of the disk that caused the error message. For more information, see "Problems with File Access" in Appendix C, "Tips and Additional Information About Multiplan."

Cell is hidden

- *You tried to go to a cell with a width of zero.*

  Change the cell width with the Format Width command.

Cell locked by External Copy

- *You tried to unlock a cell that is the destination of a linked external copy.*

  Externally linked cells cannot be changed because any change would be erased the next time you load the worksheets. To unlock the cell, you must first remove the link. To remove a link, choose External Copy, enter the source worksheet name in the "from sheet" field, enter the source name in the "name" field, press Del in the "to" field, and select Yes in the "linked" field. For more information, see Chapter 4, "Linking."

Circular reference, original cell reached

- *Cells refer to each other in a chain so that the last refers back to the first. (The simplest case is a cell containing a reference to itself, but the chain may be many steps long.) Multiplan has audited all the cells of the chain once and found itself starting over.*

  Alter the logic of the worksheet so that there is no circularity. Use the Run Audit Formulas or Run Audit Cells commands, described in Chapter 10, "Auditing a Worksheet," or use the methods described in "Formulas" in Chapter 14, "Formulas and Functions," for finding the source of error values. If you are using iteration, no action may be necessary.

Circular references unresolved

- *Cells refer to each other in a chain so that the last refers back to the first. (The simplest case is a cell containing a reference to itself, but the chain may be many steps long.) Multiplan cannot resolve circular references to obtain an exact solution.*

  Unless you are using iteration to obtain an approximate solution to your equations, alter the logic of the worksheet so that there is no circularity. For more information on iteration, see Chapter 12, "Iteration."

Clipboard cannot read or write binary formats

- *You attempted to load or save a binary (Normal, Other, Excel, or Chart format) file from the Windows Clipboard.*

  The Windows Clipboard can read and write only ASCII or SYLK files. Save the file in ASCII or SYLK format and try again. For more information, see "Transfer Options" and "Transfer Save" in Chapter 13, "Commands."

Clipboard full

- *You used the Transfer Save command to copy too much information onto the Microsoft Windows Clipboard.*

  Reduce the size of the area you want to copy onto the Clipboard or close some of the windows in Microsoft Windows to give you more memory. With more memory, you can copy more information onto the Clipboard.

Confirm change: worksheetname reference

- *Multiplan was unable to renew an external link.*

  Type any character. The rest of the External Copies, if any, will be renewed. For more information, see "External Renew" in Chapter 13, "Commands."

Disk error

- *While attempting to read or write a file, Multiplan encountered a serious disk error.*

  This error may indicate a problem with the disk drive. For more information, see "Problems with File Access" in Appendix C, "Tips and Additional Information About Multiplan."

Disk full. Overwritten file (if any) has been deleted.

- *There is no more room on the disk. The overwritten file was deleted, and the new file is stored in memory only.*

  Use the Transfer Delete command to look at the file directory and delete unnecessary files or use a different disk. For more information, see "Problems with File Access" in Appendix C, "Tips and Additional Information About Multiplan."

Enter name on external worksheet

- *The "name" field of the External Copy command requires you to specify the name of the area, the cell reference, or the range that you want to copy from a supporting worksheet into the active worksheet.*

  Enter the requested information, or press Esc to cancel the command.

Enter password for supporting worksheet

- *You chose the External Copy command and tried to copy information from a protected worksheet.*

  Enter the password for the supporting worksheet. You cannot copy information from any area of a protected worksheet that is not named "PUBLIC," unless you know the password.

Enter Y to confirm

- *You have asked Multiplan to make a major change in the active worksheet, or you are deleting a file with the Transfer Delete command.*

  If it is safe for the command to proceed, press Y. If it is not safe, press any other key, and Multiplan will return to the main command menu without changing the worksheet.

Enter Y to confirm each deletion, N to delete all, or press Esc to cancel

- *You are deleting database records with the Run Database Delete command.*

  If you are confident that all records that match the criteria can be deleted, press N to delete all matching records at once. If you are not sure, or you have records that you do not want to delete, press Y and, for each record that matches the criteria, Multiplan asks you if you want to delete or keep the record. Press Esc to cancel the command.

Enter Y to delete, N to skip, or press Esc to cancel

- *You are deleting database records with the Run Database Delete command, and you pressed Y in response to the message* Enter Y to confirm each deletion, N to delete all, or press Esc.

  If you are confident that the record can be deleted, press Y. If you are not sure, or you want to skip this record and continue checking the database for other records to delete, press N. Press Esc to cancel the command.

Enter Y to overwrite data in cell

- *The cell into which you are loading ASCII data, or the cell you have defined for a RECORD macro, is not empty. Multiplan will overwrite the existing information with the incoming ASCII data (on a cell-by-cell basis) or with RECORD macro information.*

  Carefully consider whether you want to replace the existing information. If you do not need the existing information, press Y. If you're loading ASCII data and if the existing information might be important, press N and Multiplan will skip this cell and then continue writing ASCII data into other empty cells. If you're recording a macro, pressing N will cancel the Record Macro command (Shift+F9).

Enter Y to overwrite file

- *The file that Multiplan is about to create—either a saved worksheet or a file of printer lines from the Print File command—has the same name as an existing file. If Multiplan continues, it will replace the existing file with the new one.*

  Carefully consider whether you want to replace the existing file. If you do not need the existing file, press Y. If the file might be important, press N and re-enter the command giving a different, unique filename.

Enter Y to retry access to filename

- *The file named is not accessible to Multiplan.*

  Make sure that the correct disk is in the correct drive, and press Y. If the file specified is not appropriate, press N to cancel the command and return to the command menu. If necessary, change the default drive with the Transfer Options command. For more information, see "Using Floppy Disk Drives and Hard Disks" in Appendix C, "Tips and Additional Information About Multiplan."

Enter Y to save edits, N to lose edits, or press Esc to cancel

- *You have chosen the Quit, Transfer Clear All, or Transfer Clear Window command, and one or more worksheets has unsaved edits.*

  Press Y to save the worksheet as currently displayed in the window, and then quit Multiplan. Press N to quit Multiplan without saving your revisions. Press Esc to cancel the Quit command and continue working with Multiplan.

***Error in Macro* cell reference**

- *The macro has stopped processing.*

  The macro contains information that Multiplan was unable to interpret. Look for blank spaces, incorrect command codes, and misplaced or missing apostrophes. If necessary, split the macro into several smaller macros and run them again to find where the error is happening, or press Shift+F5 to run the macro one instruction at a time. For more information, see Chapter 9, "Running Macros."

Extract range filled

- *You are extracting records from the database with the Run Database Extract command and you have specified an extract range that is too small for the number of records found.*

  Expand the extract range. If you specify just the extract headings as the extract range, the extract range goes from the extract headings to the bottom row of the worksheet.

Extract range overlaps DATABASE or CRITERIA range

- *You are extracting records from the database with the Run Database Extract command and you have specified an extract range that overlaps the database or criteria range.*

  Specify a different extract range. If you are using a named reference for the extract range, make sure that it does not overlap the database or criteria range. If you specified just the extract headings as the extract range, the extract range extends from the extract headings down to as many rows as are in the database. In this case, be sure that the extract range is not directly above the database or criteria range.

***File format error: line* number**

- *The file being read is damaged or is in an incompatible format. The file-reading process stopped at the line number displayed.*

  Check to see if the file's format is one that Multiplan supports. If it is, then the file may be damaged. Try to load a backup copy of the file.

File is not a saved worksheet

- *The file you are trying to load or link is not in a file format that Multiplan can read.*

  Make sure the "mode" field in the Transfer Options command is set correctly, or try loading the file in the ASCII format.

File is read-only

- *The worksheet file is not available for write-access.*

  The file may have been set to read-only by the DOS or OS/2 ATTRIB utility, or it may have been locked by another user on a network or by another application running under OS/2 (a file is available for write-access to only one user or application at a time).

  Load the worksheet as a read-only file.

Help file not available

- *Multiplan cannot find the file containing the online help information.*

  Copy the Multiplan Help file (MP.HLP) from the Setup disk to the disk drive and directory where you installed Multiplan. If you installed Multiplan on a 360K floppy disk, then you cannot use online help because the disk cannot store both the MP.EXE and MP.HLP files.

Ignoring out-of-range cells

- *You are using the Transfer Load command to load a Microsoft Excel worksheet that contains data in rows above row 4095 or in columns above column 255.*

  In Microsoft Excel, break the large worksheet into several smaller worksheets. When you load worksheets into Multiplan, they can have no more than 4,095 rows or 255 columns.

Incoming data mismatched in worksheetname cell reference

- *The data in the worksheets you are trying to combine with the External Total command are mismatched.*

  "Worksheet name" and "cell reference" indicate which worksheet and cell are mismatched. For example, if the incoming data is text and the existing data is a number, Multiplan displays this message for each mismatch.

  Check to be sure that the incoming worksheets have the same type of information as the active worksheet, and that the upper-leftmost cell of the active worksheet is the same as that in the incoming range.

Incorrect password

- *The password you specified for a protected worksheet was incorrect.*

  Choose the command again and enter the correct password. You cannot load or copy information from a protected file without knowing its password.

Insufficient memory

- *Multiplan has run out of memory. There is no space left to perform the specified action.*

  If you are loading a worksheet, this means that you don't have enough memory available to load it. This could be because you have too many RAM-resident programs, or because you created the worksheet on a system with more memory than this one. Eliminate the RAM-resident programs, or add more memory to your system. You may also have too many large files loaded at once. If so, close some of the windows.

  If you are entering information, this means that you have run out of working space for information. Save the worksheet at once, and then consider ways to simplify it. Clear and unlock any unused cells. If you have large areas of blank cells between areas in use, make the worksheet more compact. The Delete command removes cells from your worksheet. You may have to break your large worksheet into several smaller worksheets to fit in all the information. If you have multiple worksheets loaded, close some of the windows.

***Locked cell cannot be changed:* cell reference**

- *You attempted to modify the value of a locked cell. Note that the lock may have been set by the External Copy command.*

  If you need to change the cell, unlock it first by using the Lock Cells command. If the lock was set by the External Copy command, you must delete the link between the locked cell and the supporting worksheet.

***Name not defined:* cell reference**

- *An external copy was attempted from a named area that is not defined on the source worksheet.*

  Check the source worksheet for the correct name. Redefine the external link if necessary.

Not a valid column width

- *The column width you requested was out of range.*

  Re-enter the command. Make sure you specify the width as a number between 0 and 64, inclusive.

Not a valid extract range

- *You are extracting records from the database with the Run Database Extract command and you have specified an extract range that is incorrect.*

  Check to be sure that the extract headings are correct.

Not a valid option

- *You typed an illegal response in one of the command fields.*

  The command you chose had no effect. Enter the correct information and try again.

- *A formula contains an error. The highlighted area begins at the point where Multiplan found the error.*

  Check all punctuation, especially parentheses, quotation marks, and brackets. Check the spelling of function names. Check for a mismatch of data types, as in concatenating text to a number. See the rules for formulas in Chapter 14, "Formulas and Functions."

- *You typed a character that does not appear as a starting letter of any of the menu options on the currently displayed menu.*

  Check the menu for the option that you wish to select, and press the correct first letter of the menu item, or press Esc to cancel the command.

Not a valid transpose area

- *You cannot copy the source range of cells to the destination that you specified in the Copy Transpose command.*

  Check to be sure that the destination range is the correct shape for the transposed source range and that it stays within the bounds of the worksheet. You can also specify a single cell, and Multiplan will use this cell as the upper-left corner of the destination range.

Not found

- *Multiplan did not find a record in the database that matches the criteria from the current position of the cell pointer to the end of the database in the direction you specified.*

  Press the Up Arrow or Down Arrow key to continue searching, or press Esc to return to the main command menu.

Press any key to redraw screen

- *The External List command has put information on the screen in place of the usual display.*

  When you have seen enough of the information, press any key to return to the normal display.

Printer error

- *The printer is not responding to a Multiplan request.*

  Check to see that the printer is connected properly and ready to print and make sure you are using the correct printer driver. Also check the Print Setup command to make sure that you are sending information to the correct printer.

  If you're using a printer that does not have a printer driver, make sure the TEXT printer driver is selected in the Print Setup command, and use the Mode command at the DOS or OS/2 prompt. For more information on the Mode command, see your DOS or OS/2 manual.

Printing. . .

- *Printing is in progress.*

  No action is required. The main command menu returns when printing is complete. Press Esc to stop printing and return to the main command menu.

Program stayed resident. Press a key to quit Multiplan.

- *You ran a memory-resident program with the Run command.*

  Multiplan is not able to continue. Press a key and start again. Any information entered on the worksheet and not saved at the time you performed the Run command is lost and must be entered again. Do not run any program that loads itself into RAM and stays resident or that changes the way your computer communicates (such as MODE) after you start Multiplan.

Read-only file must be saved with a different name

- *You cannot save a worksheet opened as a read-only file with the same filename.*

  Save the worksheet with a different filename.

***Reading line* number**

- *Multiplan is reading a file stored in a format other than Multiplan (Normal) format, or stored by a previous version of Multiplan.*

  No action is required. The line number increases as Multiplan reads through the file. When the file has been read completely, you can continue your Multiplan session.

RECORD range filled, Record Macro stopped

- *You are recording a macro and you have filled the last cell in the RECORD area.*

  Expand the RECORD macro area with the Name command.

Response too long

- *The command, formula, or text on the command line is too long to be displayed there.*

  You must shorten the command, formula, or text.

- *The formula or text being edited has more numbers or words than Multiplan can handle for purposes of moving from word to word with F7 (word left) and F8 (word right).*

  No action needed; the formula or text is valid and may be used. However, F7 and F8 cannot be used while editing the formula or text.

- *Names cannot exceed 31 characters. The name you have entered exceeds this.*

  Use a shorter name.

Shapes of areas do not match

- *The destination area of an External Copy or External Total command does not have the same dimensions as the source area.*

  Specify a single cell as the upper-left corner of the destination so that Multiplan will not check the shape. However, because the mismatch occurred, you should review the names on the supporting worksheet and on the active worksheet.

Too many lines in header/footer

- *You must allow at least one line per page to print worksheet information.*

  Reduce the number of lines in the header and footer, or increase the number of lines on the page. For more information on headers and footers, see Chapter 3, "Printing a Worksheet."

Too many windows

- *There is a limit of eight windows and the Window Split command has been used in an attempt to open a ninth.*

  Review the existing windows and use the Window Close command to close some of them if necessary.

Use the Name command to define CRITERIA range

- *Multiplan tried to perform one of the Run Database commands, but could not find a criteria range.*

  Check to be sure that the criteria range is named "criteria," that it consists of at least two rows, and that it does not overlap the database range.

Use the Name command to define DATABASE range

- *Multiplan tried to perform one of the Run Database commands, but could not find a database range.*

  Check to be sure that the database range is named "database," that it consists of at least two rows, and that the columns have valid field names.

Use the Name command to define macro RECORD area

- *You are trying to record a macro and the RECORD macro area is not set up.*

  Set up the RECORD macro area with the Name command or enter the macro contents with the Alpha command.

Values substituted for invalid formulas

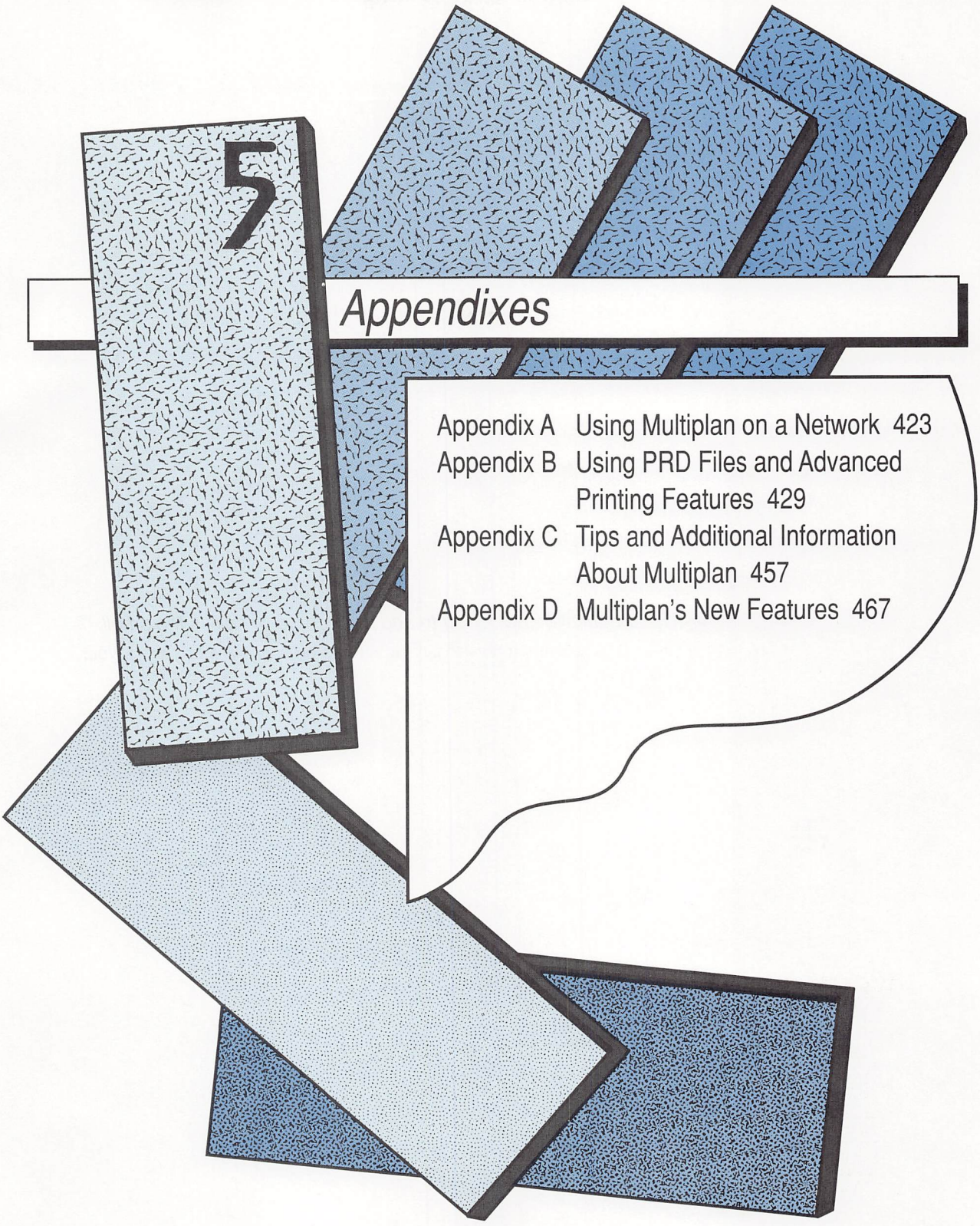
- *You are using the Transfer Load command to load a worksheet, and Multiplan could not interpret a formula in that worksheet.*

  Carefully examine the worksheet to see where you need to change the formulas to Multiplan formulas.

Window will not fit

- *The window you are trying to add a border to or split is too small.*

  Close an adjacent window to get more room on the screen or rethink your screen layout.



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Appendix A
Using Multiplan on a Network

You can install and run Multiplan on most networks. This means that you can install it on a file server computer, and then run Multiplan from a remote terminal. Installing Multiplan on a network is similar to installing it on a hard disk, but you must follow a few additional steps. The following information is intended for the network administrator and assumes that the administrator is familiar with DOS or OS/2 and network commands.

Installing Multiplan on a Network

Multiplan can be run by more than one user at a time, but all users must be licensed to use Multiplan on the network. Please read the licensing agreement before installing Multiplan on a network. Use the SETUP program to install Multiplan on the network drive just as you would install it on a hard disk. Before beginning, make sure that the network server maps to a drive letter on your workstation.

To use the SETUP program

1. Insert the Setup disk in drive A and close the drive.
2. Type **a:setup** and press Enter.
3. Follow the directions on the screen.

Once the installation is completed, give the Multiplan executable file read-only access.

To set read-only access for the MP.EXE file

1. Change to the drive and directory where Multiplan is installed.
2. Type **attrib +r mp.exe** and press Enter.

NOTE On some networks, you must use special network commands to make the MP.EXE file sharable and to give it read-only access.

Make sure that all users have a compatible version of the network software and have access to the Multiplan program directory and to all subdirectories on the path leading from the root directory to the program directory. For more information, see your network manual.

Running Multiplan on a Network with More Than One Type of Display Adapter

If all users on the network have IBM Monochrome, CGA compatibles without snow, IBM EGA, or IBM VGA or compatible display adapters, then you do not have to follow any special steps.

If some users have Hercules Graphics Cards, Hercules Graphics Plus Cards, Hercules InColor Cards, IBM CGA with snow, AT&T 6300 Graphics Cards, or Ericsson Graphics Cards, complete the following procedure.

To set up the network with several display adapters

1. Copy all display adapter files (*.VID) from the Multiplan disks to the Multiplan directory on the network server.

   Do not run the SETUP program to copy the *.VID files.

2. Set the MPVID environment variable in each workstation for the display adapter it uses. To set this environment variable, you must include a single line in the DOS AUTOEXEC.BAT file or the OS/2 CONFIG.SYS file in this form:

   SET MPVID=*displayadapter*.VID

   Here are some examples:

   For Hercules Graphics Cards: SET MPVID=HERC102.VID

   For Hercules InColor and Graphics Plus Cards: SET MPVID=HERC112.VID

   For IBM CGA with snow: SET MPVID=CGASNOW.VID

   For AT&T 6300 Graphics Cards: SET MPVID=ATT6300.VID

   For Ericsson Graphics Cards: SET MPVID=ERICSSON.VID

   These MPVID settings override the display adapter that you selected with the SETUP program, and allow different users to use different display adapters while running the same copy of Multiplan.

Starting Multiplan on a Network

The network administrator should modify each user's command search path using the DOS or OS/2 Path command to include the drive and directory where Multiplan is installed. The Path command can be carried out from the DOS or OS/2 prompt, or it can be included in the DOS AUTOEXEC.BAT file or the OS/2 CONFIG.SYS file. For more information about the Path command, AUTOEXEC.BAT files, and CONFIG.SYS files, see your DOS or OS/2 manual.

To start Multiplan on a network

1. If you have not already done so, turn on your computer and go through its normal startup procedure.
2. If the Multiplan drive and directory are included in the command search path, type **mp** at the system prompt and press Enter.

   If the Multiplan drive and directory are not included in the command search path, type **d:\mp\mp** at the system prompt and press Enter.

   The previous step assumes your network drive is drive D, and that Multiplan is installed in a directory called MP. If you want to use different drives or a different directory, you must substitute your drive and directory path.

   If Multiplan fails to start, review the setup instructions to make sure that the Multiplan files are installed correctly, that the computer is correctly set up on the network and has access to the Multiplan files, and that the Multiplan drive and directory are included in the command search path.

   You can also start Multiplan by changing to that drive and directory using the DOS or OS/2 Chdir command, typing **mp**, and pressing Enter. However, you will not be able to use your own copy of the MP.INI file if you start Multiplan using this method. For more information, see "Using the MP.INI File on a Network" later in this chapter and "The MP.INI File" in Appendix C, "Tips and Additional Information About Multiplan."

Read-Only Access

When you load a worksheet with the Transfer Load command, if you set the "read only" field to Yes or if another user on the network has already loaded the worksheet with read/write access or if the worksheet has been set to read only by the DOS or OS/2 Attrib command, then you have **read-only** access to the worksheet. Read-only access means that you can examine ("read") a worksheet, but that you cannot save changes to the file you loaded from. You can, however, make changes and save the changes by saving the worksheet with a different filename. For more information, see "Choosing Read-Only Access" in "Transfer Load" in Chapter 13, "Commands."

If you are the first person to load a worksheet from the network, then only you have both **read-write** access to that worksheet. The other users on the network can read the worksheet, but they cannot change it. Only one person can have write-access to the same file at the same time. If you want to load a worksheet but do not want to change it, then you can select Yes in the "read only" field of the Transfer Load command so that the next person who loads the worksheet can write to it. If someone else has loaded the file with read-only access, again you can load the worksheet file for either read-only or read-write access.

Worksheet files can also be set for read-only access, no matter how many people are using them, by using the ATTRIB utility supplied with DOS and OS/2. You may want to set certain worksheet files for read-only access to prevent them from being altered. Worksheet files with read-only access can only be loaded for read-only access with the Transfer Load command. For more information on ATTRIB, see your DOS or OS/2 manual.

NOTE On some networks, you must use special network commands to make worksheet files sharable and to give them read-only access. For more information, see your network manual.

Printing

You can use the "adapter" field in the Print Setup command to specify where you want to print information. In the "adapter" field, you can enter the name of any valid output device, such as LPT1:, PRN:, or COM2: (the colon at the end of the device name is optional). Multiplan checks the output devices on your system and displays an error message if you specify an incorrect output device. For more information, see "Print Setup" in Chapter 13, "Commands" and Appendix B, "Using PRD Files and Advanced Printing Features."

NOTE You may have to use the DOS or OS/2 MODE utility to set up the communications protocol for the printer. For more information about setting up communications protocol, see your DOS or OS/2 manual and your printer manual.

Multiplan automatically adds a form feed at the end of each worksheet or report you send to the printer. This causes the printer to skip to the top of the next page.

Multiplan starts printing a worksheet or report as soon as you send the job to the printer, rather than at the end of your Multiplan session.

Using the MP.INI File on a Network

The MP.INI file holds setup information for Multiplan, such as screen colors, screen height, borders, and so on. When Multiplan is installed on a network, it looks for the MP.INI file in the startup drive and directory, rather than in the drive and directory where Multiplan is installed. With this feature, users can have their own copy of the MP.INI file. If Multiplan cannot find the MP.INI file in the startup drive and directory, it creates an MP.INI file with the default setup information. For more information, see "The MP.INI File" in Appendix C, "Tips and Additional Information About Multiplan."

Appendix B
Using PRD Files and Advanced Printing Features

Printers differ in their abilities to use fonts, spacing, alignment, and character formats. The appearance of your printed documents depends on which formats you assign and which formats your printer can print. Multiplan adjusts to your printer's requirements, using the printer's features to print formats as close as possible to those you choose.

Preparing to Print

In general, the more you know about your printer the easier it is to print worksheets with it. For example, differences in how paper is fed to the printer can cause variations in the top and bottom margins. You should read your printer manual thoroughly before printing.

To make sure you are ready to start printing with Multiplan, you may want to check the following points:

- Install your printer according to the manufacturer's instructions. Make sure it is connected to the correct port, and that the baud rate and other switches are set correctly. For details on setting up your printer, see your printer manual.

  If your printer is connected to a serial port, use the DOS or OS/2 Mode command to set parameters for your printer. For example, to set the baud rate to 9600, no parity, 8 data bits, 1 stop bit, and perpetual retry, type **mode com1:9600,n,8,1,p** at the DOS or OS/2 prompt. You may want to create a DOS AUTOEXEC.BAT file or OS/2 STARTUP.CMD file to do this automatically or add this information to the existing files. For more information, see your DOS or OS/2 manual.
- Make sure you have the correct cable for your printer, especially if you are connecting it to a serial port. Make sure it is connected to the correct port.
- Make sure your printer is plugged in and turned on.
- Try printing something other than a worksheet, to make sure that the printer is working.

When you run the SETUP program, you will see a list of printers. Choose your printer from the list. If your printer uses font cartridges, make sure you choose the correct PRD file for your font cartridge (PRD files are explained in detail in the next section). In some cases a single PRD file may support more than one cartridge.

You can choose as many PRD files as you like.

- You may want to choose the Print Setup command to check your settings. It is especially important to make sure that the right port is specified in the "adapter" field, and that the "printer" field contains the correct PRD filename.
- You may need to adjust margins and headers to fit the requirements of your printer. For example, some printers can print lines up to only 8 inches long; others advance the paper before starting to print.
- On some printers, you may need to check the position of the print head. The top margin will start at the location of the print head when you choose Print Printer.

Printer Description (PRD) Files

Since printers differ, Multiplan makes adjustments to take advantage of the features of each printer. Multiplan achieves this flexibility by using a printer description, or PRD, file as the link between Multiplan and each printer. This file is sometimes called a printer driver.

The Multiplan disks include PRD files for many popular printers. You can recognize PRD files by their .PRD filename extension.

The PRD file contains important information about your printer:

- Descriptions of fonts
- Control sequences the printer uses to achieve various styles

Changing Printer Drivers

If Multiplan has a PRD file for your printer, then you probably copied it when you ran the SETUP program. If you add a new printer to your system, you may need to copy a new printer driver. To see which printers Multiplan supports, examine the PRINTERS.DOC file on the Utilities disk or type **dir *.prd** at the DOS or OS/2 prompt.

When you switch from one printer to another, you may need to enter new information in some fields.

To change printer drivers

1. If you don't have PRD files for all your printers, run the SETUP program or use the DOS or OS/2 Copy command to copy the PRD files to your Program disk, or to the directory on your hard disk where the Multiplan program files are.
2. Choose Print Setup and type the name of the PRD file you want to use in the "printer" field, or press a direction key to select from a list of PRD files in the current directory.
3. If you have multiple printers attached to your computer, make sure the "adapter" field in Print Setup contains the port for the printer you want to print with.
4. Choose Format Font to check the "font name" and "size" fields.
5. Choose Print Margins and Print Heading to adjust margins and placement of headings to the requirements of your printer.
6. Choose Print Printer when you are ready to start printing.

IMPORTANT If Multiplan does not have a PRD file for your printer, you can print documents by setting the "printer" field of the Print Setup command to TEXT, but Multiplan will not use any of your printer's special features. You can also create a custom printer driver by modifying the PLAIN.PRD file using the information in the next section, and you can insert printer control codes directly in your worksheet, as explained at the end of this appendix. You can also try specifying a printer driver that is intended for a printer similar to yours.

Using the MakePRD Program

The MakePRD program provides a way to create and modify printer driver (PRD) files. Advanced Multiplan users, programmers, and printer manufacturers may find MakePRD useful. MakePRD is on the Multiplan Utilities disk.

You don't need to use MakePRD to print with Multiplan. Even if Multiplan does not have a special PRD file for your printer, you can use the generic TEXT printer driver which is built into Multiplan. If your printer emulates an industry-standard printer, such as the Epson FX, Diablo 630, or Hewlett-Packard LaserJet, you may be able to use one of their PRD files.

IMPORTANT If you're using a computer running under OS/2, then you must run MAKEPRD.EXE in the DOS window of OS/2.

You can use Multiplan's MakePRD program to modify Microsoft Word PRD files, and you can specify Microsoft Word PRD files in the "printer" field of Multiplan's Print Setup command. However, there are often differences between Multiplan's PRD files and Microsoft Word's PRD files.

In printer control sequence descriptions (PCSDs) for styles, Multiplan supports only mod0 sequences to produce the four supported styles (bold, underline, strikethrough, and italic). PRD files for Microsoft Word may use different methods for producing a style (for example, mod3 might be used to make the printer produce an underline style using the printer's graphic commands), so if you specify a Microsoft Word PRD file in the Print Setup command, Multiplan may not be able to produce the style correctly.

If a printer does not support a style, then Multiplan tries to "synthesize" the style by backspacing and overtyping. (Multiplan also attempts to synthesize styles when it encounters PCSDs with a mod sequence that it cannot interpret or if no mod sequence is specified at all.) If the printer does not support backspacing, then the Multiplan PRD file should specify a null mod0 sequence, and Multiplan will not attempt to synthesize the style.

Multiplan does not support proportionally-spaced fonts.

About MakePRD

MakePRD creates a new text file based on the contents of an existing binary PRD file. You can load this new text file into a text editor, modify it, then create a new binary PRD file.

The following procedure provides the steps you will follow to create a new PRD file. Read through the procedure and familiarize yourself with the rest of the information in this chapter before you begin.

To modify a PRD file

1. Consult the technical reference guide provided by the printer manufacturer for information on the control codes your printer uses.
2. Read the "Text File Format" section of this appendix carefully before attempting to modify a PRD file.
3. Decide which PRD file will work best with your printer. For example, you could use EPSONLX.PRD with any of the Epson LX series of printers. If you are not sure which PRD file to use, use PLAIN.PRD.
4. Always make backup copies of any PRD file you want to modify. Then, if the new PRD file doesn't work, you'll still have a copy of the original.
5. Run the MakePRD program to create a text file based on the contents of the existing binary PRD file. (Running MakePRD is described in the next section.)
6. Use a text editor to make the necessary changes to the text file. What you change depends on which styles or fonts you are implementing. For more information, see "Text File Format," later in this appendix.
7. Run the MakePRD program again to create a new binary PRD file based on the contents of the text file.

WARNING Give the new binary PRD file a new name to avoid overwriting the original PRD file.

8 Start Multiplan, choose Print Setup, and enter the filename of the new PRD file in the "printer" field.

9 Test the new PRD file by printing several documents. If you find a problem, go back to step 1 and repeat this procedure, making additional changes until the printer works to your satisfaction.

Running MakePRD

This section explains how to run the MakePRD program.

NOTE You can exit the program by pressing Esc whenever the program is waiting for input.

To run MakePRD

1 Insert a copy of the Multiplan Utilities disk into drive A.

2 Copy MAKEPRD.EXE to the directory on your disk containing the Multiplan printer drivers.

For example, if the printer drivers are located in the MP directory of drive C, type: **copy a:makeprd.exe c:\mp**

3 At the DOS prompt (use the DOS window if you're using OS/2), type: **makeprd**

MakePRD prompts you for a PRD filename.

4 Type the filename of the PRD file you want to convert (for example, **custompr.prd**, or **c:\printers\custompr.prd**). If you are converting from a text file to a binary PRD file, enter the name of a PRD file, even if it doesn't yet exist, and include the .PRD filename extension.

MakePRD prompts you for a text filename.

5 Type a name for the text file (for example, **custompr.doc**).

MakePRD asks if you are converting from a text file to a PRD file or vice versa.

6 Type **t** to create a text file, or **p** to create a PRD file.

MakePRD creates the file requested, displays a message telling you the conversion is complete, and returns you to the operating system prompt.

You can also run MakePRD by typing: **makeprd**/*switch prdfilename textfilename*

The switch can be either /p to convert from text to PRD file format, or /t to convert from PRD format to text. For example, you could create a text file from the CUSTOMPR.PRD file by typing: **makeprd/t custompr.prd custompr.doc**

Text File Format

Once you create a text file, you can load it into a text editor. Make sure you understand the text file's format before you make any changes.

The PRD text file is organized into five sections:

Section	Function
The Header	Describes the printer hardware and gives details about the printing interface
The Model Block	Describes the capabilities of each printer model the PRD file supports
Font Description	Describes each font and size available
Character Translation Table (CTT)	Describes how to produce characters that are not normally found on your printer
Printer Control Sequence Description (PCSD)	Contains codes for controlling character formats, margins, and sheet feeder options

Before you start modifying the text file, you need to know which control codes your printer requires, as well as other technical information about your printer. This information is usually provided in your printer manual. If you do not understand the information in your printer manual, ask your dealer or printer manufacturer for clarification. Microsoft Product Support personnel cannot provide information about printers whose drivers are not included with Multiplan.

If you want to add or change a character format, you need to enter the control codes your printer requires for the desired format. For information about how to enter codes for adding subscripts, superscripts, sheet feeder controls, bold, italic, underline, and other formats or capabilities, see "Printer Control Sequence Description," later in this appendix.

Most PRD files use units of twips for space measurements. A twip is 1/20 point or 1/1440 inch. Laser printer PRD files don't use twips. The basic unit of measurement for laser printers is 1/300 inch, which corresponds to the number of dots per inch laser printers can print.

The next section describes how to enter control codes in a text file.

Entering Control Codes

Control codes for your printer are entered in the Font Description and PCSD sections of the PRD text file.

Control codes consist of characters preceded by a caret (^) enclosed in double quotation marks. The caret indicates that the following character will be sent to the printer as a control character (as if the Ctrl key were pressed). For example, you type **"^O"** to send Ctrl+O.

Converting Control Codes

If the control code to be sent to the printer has a decimal value of less than 32, you need to convert the control code. To convert, add 64 to the decimal value of the control code, and look up the sum in an ASCII table. Then use the ASCII character in the table that the sum represents.

For example, the decimal representation of Esc is 27. If you add 64 to 27, the sum is 91. Look up decimal 91 in an ASCII table. It corresponds to the left square bracket [. Therefore, the control code for Esc is ^[, so you would type **"^["**. Many printers use the Esc character plus various letters for control codes. To send an Esc+G, for example, you would type **"^[G"**

Some newer printers have control codes between decimal 128 and 159. You can enter the decimal, hex, or octal values of these codes.

For decimal values, the control sequence starts with a caret followed by a zero, then a "d" (for decimal) and the decimal representation of the character. For example, the control sequence for 159 in decimal is ^0d159

For hex values, the control sequence starts with a caret, followed by a zero, then an "x" for hex and the hex representation of the character. For example, for the control sequence decimal 159, the hex equivalent is 9F, so the control sequence in hex is ^0x9F

For octal values, the control sequence starts with a caret, followed by zero, and then the three-digit octal representation of the character. A space terminates the octal number. You need to follow each number with a space before entering the next character in the control sequence. For example, for the control sequence decimal 159, the octal equivalent is 233, so the control sequence in octal is ^0233

The Header

The Header section of the PRD file describes the type of printer used (dot matrix, daisywheel, laser, and so on), and includes information about printer head movement and printer interface. For example:

```
MAKEPRD 2.00
dxaMin:12 dyaMin:20 PrinterType:1
Microspace:1 SpecialFlags:0 SerialInterface:40960
WidthTSwap:0
```

The following are flags in the Header section.

dxaMin:# Minimum horizontal printer head movement, in twips (1/1440 inch), unless the printer is a laser printer (type 5, as defined in the PrinterType flag below). For laser printers, dxaMin should be set to 300.

For example, for a dot matrix printer, dxaMin:1 indicates a minimum movement of 1 twip, or 1/1440 inch. For a laser printer, dxaMin:300 indicates that the minimum printer head movement is 1/300 inch.

dyaMin:# Minimum vertical printer head movement, measured in the same way as dxaMin.

PrinterType:# Specify a printer type using the following information:

1	Dot matrix printer
2	Daisywheel printer
3	Other types of printers
5	Laser printers

The Model Block

The Model Block section is designed to let similar printer models with different capabilities share the same PRD file. For example:

```
{M
cPMDs:1

InhibitCTT:0 InhibitRevLF:0
LinedrawAutoMap:0 LinedrawNoShade:0
LinedrawFlag:3 LinedrawFont:0 LinedrawAdjust:0
ColorMod:0 ColorFlags:0 DuplexFlag:0 OrientationFlag:0
AutoSkipTop:0 UnprintableTop:0
AutoSkipLeft:0 UnprintableLeft:0
UnprintableBottom:0 UnprintableRight:0
DownloadFlag:0
GraphicsNotSupported:NIL
FontsNotSupported:NIL
BinsSupported:NIL
IniFile:NIL
ModelName:TI-850
}M
```

Within the Model Block, descriptions of different printers are divided into separate model listings. Many PRD files have just one model listing. Each model listing contains information about the following capabilities and settings that Multiplan can use:

- Color
- Available fonts
- Model name

{M This code begins the Model Block.

cPMDs:# The number of printer models described in the Model Block. For example, if the Model Block contains listings for three models, this flag should read: cPMDs:3

InhibitCTT:# Indicates whether to refer to a Character Translation Table (or tables) for this model. For example, Multiplan sometimes uses a Character Translation Table to supply the IBM extended character set for models that don't come with it. Models that have their own support for the IBM extended character set do not need this table.

The values for this flag are:

0	Use the Character Translation Table specified with the CTP flag for each font.
1	Ignore any references to a Character Translation Table specified with the CTP flag for each font.

ColorMod:# Describes the model's color capability. If a model cannot print colors, the value for this flag should be 0.

The values for this flag are:

0	Monochrome. Black is the only color available.
1	Color. Red, green, blue, violet, magenta, yellow, white, and black are available.

FontsNotSupported: font# font# font# Some models do not support all the fonts described in the PRD file. This flag marks which fonts the model does not support so that they are not enumerated by the Format Font command.

To mark a font as not supported, enter the font number assigned to it in the Font Description section of the PRD file. Leave a space between font numbers. All the fonts described in a PRD file—except the default font (F0)—can be marked as not supported.

If the model supports all the fonts described in the PRD file, set the flag to: FontsNotSupported:NIL

For example, suppose the model does not support Elite, Helvetica, and Times Roman, and these fonts are numbered F2, F8, and F24 in the Font Description section. To mark them as not supported, the flag should read: FontsNotSupported:2 8 24

ModelName: name of model Contains the name that appears in the "model" field of the Print Setup command. The name can be up to 26 characters long and can be any combination of characters, including spaces. It is terminated by a carriage return.

}M This code ends the Model Block section.

Font Description

The Font Description section of the PRD file describes the fonts and font sizes available for the printer. For example:

```
{F0
CTP:T0
cPSDs:1
FontSize:24
Wtps:12 12 12 12
beginmod:0
endmod:0
beginItalicmod:0
endItalicmod:0
beginBoldmod:0
endBoldmod:0
beginItalBoldmod:0
endItalBoldmod:0
DLF:0
LineSpacing:12
FontName:Pica
}F
```

Multiplan supports only fixed-pitch fonts.

{F# This code marks the beginning of a font description. The first font, F0, defines the default font for the printer. It must be either a 10-pitch or 12-pitch, fixed-pitch font.

The font numbering system allows compatibility across different printers. For example, on one printer, font number two (F2) might be Elite. Another printer may not have an Elite font, but whichever font has been assigned number two (F2) will be used instead.

Up to 64 fonts can be described in a PRD file. Fonts are numbered and described in the Font Description section in ascending, but not necessarily consecutive, order, for example, F0, F1, F4, F10.

CTP:value This flag "points" to a Character Translation Table and tells the printer to use it to interpret characters in the font. The value is the number of the Character Translation Table used for the font. More than one font may use the same Character Translation Table.

If you do not need to use a Character Translation Table, the flag should read: CTP: NIL. For more information, see "Character Translation Table," later in this appendix.

cPSDs:# Indicates the number (or "count") of available sizes for the font currently being described. For example, if the font "Courier" has three available sizes, the flag should read: cPSDs:3

Printer Sequence Description For each size available for a font, there is a Printer Sequence Description (PSD). The font sizes and their accompanying PSDs must be arranged in ascending order. The smallest size is described first, followed by the next largest, and so on. Each PSD has the following labels:

- ***FontSize:#***

  Identifies the font size in half-points. The font size in points can be determined by dividing the number of characters per inch (pitch) into 120. For example, 10 (pitch) divided into 120 equals 12 (points). The font size for a standard 10-pitch font is 12 points. Since the measurement used in *FontSize* is in half points, the value required by the PRD file for a 12-point font is 24 (12 x 2).

- ***Wtps:*** value1 value2 value3 value4

  The Wtps label is followed by four values. They define the width of the font's normal characters as well as characters with bold and italic formats.

value1 =	Width of normal characters
value2 =	Width of italic characters
value3 =	Width of bold characters
value4 =	Width of bold-italic characters

  For fixed-pitch fonts, the Wtps values equal the characters' widths in units of dxaMin (see "dxaMin" in "The Header," earlier in this appendix). For proportional fonts, the values refer (or "point") to a Character Width Table (CWT) that defines individual character widths.

  You can calculate the Wtps value for fixed-pitch fonts using the following formula: 1440/CPI/dxaMin = Wtps.

  For example, if your printer manual states that a font prints at 17.16 cpi (characters per inch) in compressed mode, and the dxaMin value for your printer is 12, the equation would be 1440/17.16/12=7. Assuming all the italic and bold characters have the same width, the Wtps value would be: Wtps: 7 7 7 7

- ***beginmod:*** modvalue "codes"

  This label tells the printer how to begin printing in this font size. *Beginmod:* is followed immediately by a number, and the line is ended with a control code enclosed in quotation marks.

  For example, mod:0 "^O" means no special mod required, and the control code used to start this font size is Ctrl+O. When you print, Multiplan sends the control code at the beginning of the text formatted in this font and size.

  Although Microsoft Word recognizes *mod:* values 0 through 5, Multiplan recognizes only mod0, the default action, and mod1, which informs Multiplan that the particular font cannot be made bold.

  The control code specifies what characters must be sent to the printer to direct it to begin printing in the specified font and size. The syntax is the same as for any other control code.

- ***endmod:*** modvalue "code"

  This is the code required to end this font size. Usually this code reverts the font to the default, 10-pitch font for the printer. The modvalues are the same as those for *beginmod* above.

- ***beginItalicmod:*** modvalue "code"

  This code tells the printer to start printing text in a separate italic font. The modvalues recognized are the same as those for *beginmod* above.

  For most printers, specifying this code is not necessary. It is required only for those printers that create italic by using separate fonts initiated with their own control codes. If a printer has only one italic sequence for all fonts, leave *beginItalicmod* blank, and use the standard italic Printer Control Sequence Description (PCSD). See "Printer Control Sequence Description," later in this appendix.

- ***endItalicmod:*** modvalue "code"

  This label ends the italic font initiated with *beginItalicmod*. It is necessary only if you used *beginItalicmod*. Usually the control code reverts the font to the default, 10-pitch font for the printer. The modvalues are the same as those for *beginmod*.

- ***beginBoldmod:*** modvalue "code"

  This label works just as *beginItalicmod* does. It tells the printer to start printing in a separate bold font. The modvalues recognized are the same as those for *beginmod*. The control code is the one that initiates the appropriate bold font.

  For most printers, specifying this code is not necessary. It is required only by those printers that create bold by using separate fonts.

- ***endBoldmod:*** modvalue "code"

  This label ends the bold font initiated with *beginBoldmod*. It is necessary only if you used *beginBoldmod*. Usually the control code reverts the font to the default, 10-pitch font for the printer. The modvalues are the same as those for *beginmod*.

- ***beginItalBoldmod:*** modvalue "code"

  This label works just as *beginItalicmod* does. It tells the printer to start printing in separate bold-italic font. The modvalues recognized are the same as those for *beginmod*. The control code is the one that initiates the appropriate bold-italic font.

  For most printers, specifying this code is unnecessary. It is required only for those printers that create bold-italic by using separate fonts.

- ***endItalBoldmod:*** modvalue "code"

  This label ends the bold-italic font initiated with *beginItalBoldmod*. It is necessary only if you used *beginItalBoldmod*. Usually the control code reverts the font to the default, 10-pitch font for the printer. The "modvalues" are the same as those for *beginmod*.

More Font Sizes For each additional font size, there is an additional PSD, until all the sizes for a font are defined.

FontName: name Immediately before the end of the Font Description section is the font name, such as Pica or Courier. This name appears in the "font name" field of the Format Character command.

}F This code identifies the end of the Font Description section for each font. If there is more than one font, the next font description would start immediately with another {F# code.

Character Translation Table

A Character Translation Table (CTT) is used to create characters not normally found on your printer or keyboard, or to map printer characters to match screen symbols. For example:

```
{T0
cCSD:1 chFirst:128 chLast:175
128: "C^H," 129: "u^H"¨" 130: "e^H'" 131: "a^H^0d094 "
132: "a^H"¨" 133: "a^H`" 134: "a" 135: "c^H,"
136: "e^H^0d094 " 137: "e^H"¨" 138: "e^H`" 139: "i^H"¨"
140: "i^H^0d094 " 141: "i^H`" 142: "A^H"¨" 143: "A"
144: "E^H'" 145: "a" 146: "A" 147: "o^H^0d094 "
148: "o^H"¨" 149: "o^H`" 150: "u^H^0d094 " 151: "u^H`"
152: "y^H"¨" 153: "O^H"¨" 154: "U^H"¨" 155: "c^H/"
156: "#" 157: "Y^H=" 158: "P" 159: "f"
160: "a^H'" 161: "i^H'" 162: "o^H'" 163: "u^H'"
164: "n^H~" 165: "N^H~" 166: "a^H_" 167: "o^H_"
168: "^0d168 " 169: "^0d169 " 170: "^0d170 " 171: "^0d171 "
172: "^0d172 " 173: "^0d173 " 174: "<^H=" 175: ">^H="

}T
```

The CTT is "pointed to" by the CTP flag in the font description section of the PRD file. For more information, see "Font Description" earlier in this appendix.

In the CTT, you define a string of characters (usually a control sequence) to print in place of the translated character. When Multiplan encounters one of the translated characters, it prints the string of characters specified for that translated character.

You can use the CTT to create foreign characters, graphics characters, and math symbols. Some of the PRD files provided with Multiplan use this feature to emulate the IBM extended character set. For example, to get a "greater than or equal to" symbol, you could define the extended ASCII character 242 to print a > and then an underline, with a backspace (^H) between them by typing **">^H_"**

You can use a CTT to map special characters from the printer's character set to the character set of your computer. In this way, the character you type on the screen will print on the printer. You can also use a CTT to substitute one character for another.

{T# This code marks the beginning of the Character Translation Table (CTT) section. The first Character Translation Table described is numbered T0, the second T1, and so on.

cCSD:# The # represents the number of CSDs (Character Sequence Descriptions). A CSD consists of two labels, chFirst and chLast, which define the first and last characters of a CSD and consecutive numbers to be translated.

For the range of ASCII characters defined by chFirst and chLast, the CSD must have an entry for every character. The entry may be blank, but it must be included.

For that reason, it makes sense to use more than one CSD if there are large gaps in the sequence of characters to be translated.

For example, if you want to define characters 1 to 32 and 176 to 254, you could define all characters from 1 to 32 with one CSD, and all characters between 176 and 254 with another. If you used just one CSD, you would need to have entries for all the characters between 32 and 176 that you didn't wish to define.

The CSDs are made up of chFirst, chLast, and the table itself.

- ***chFirst:# chLast:#***

  The chFirst label specifies the ASCII value of the first character defined, and the chLast label specifies the last character in a particular CSD. ChFirst and chLast figures must be supplied for each CSD.

- ***The table itself***

  The table is a series of numbers starting with the number set as chFirst and ending with the number set as chLast. The format is:

  #:"string of characters" #:"string..." #:"string..."

  where # is the ASCII value of the character to be translated. Make sure you place the string of characters inside quotation marks.

If you don't want to translate a particular character in the sequence, put that character by itself between quotation marks (for example, you type **"174"**).

The syntax for two CSDs is as follows:

cCSD:2
chFirst: # chLast: #
#:"string of characters" #:"string..."
chFirst: # chLast: #
#:"string of characters" #:"string..."

Enter characters above decimal 127 by holding down Alt and typing the decimal code for the character on the keypad. You also can use the hex or octal representations, as described in "Entering Control Codes" earlier in this appendix.

}T This code marks the end of the Character Translation Table.

Printer Control Sequence Description

This section describes the control codes or other methods used by the printer for producing formats such as bold, underline, subscript, and superscript. It also contains codes for initializing the printer, sheet feed control codes, and so on. Each code is referenced by its byte location. For example:

```
{P
byte:0 mod:0 "^[@"
byte:4 mod:0
byte:8 mod:0 magic:0 value:255 "^[C"
byte:14 mod:0
byte:18 mod:1 magic:0 value:85 "^[A"
...
byte:224 mod:0
byte:228 mod:0
byte:232 mod:0
byte:236 mod:0
byte:240 mod:0
}P
```

{P This code marks the beginning of the Printer Control Sequence Description (PCSD) section.

Short PCSDs

Most printer control sequences are of the "short" variety described in this section. "Long" PCSDs have two additional fields that are described below.

byte:# mod:# "code" The byte value set with this label determines the byte's location in the binary PRD file. The byte value also determines the function it serves. Byte values and their functions are listed at the end of this section.

You can use the *mod:* number to supply additional information to Multiplan on steps required to perform a particular function. It is usually set to 0 (*mod:0*), which indicates no modification. The mod values for specific PCSD bytes are listed in the "Descriptions of PCSD Bytes" section later in this appendix. Many bytes do not have mod values.

A control code follows the *mod* number. This is a sequence of characters or codes that command the printer to perform a particular function. For information on how to enter control codes, see "Entering Control Codes," earlier in this appendix.

Long PCSDs

Long PCSDs are located at bytes 8, 18, 28, 82, 144, 154, 164, 174, 184, and 194. Long PCSDs differ from short printer control sequences in that they have two additional fields, *magic:* and *value:*.

magic:# Use this number as an offset if your printer requires a nonzero-based value to perform a specified function. If you specify a *magic* value, it will be added to the number before sending. Usually, the *magic* value is not required, so you should set it to 0.

If the printer cannot accept 0 as a value, you need to offset the values that Multiplan computes by 1 to ensure that 0 is not set. A *magic* value of 1 ensures that 1 is added to the value that is sent to the printer.

value:# This number specifies the maximum value that can be used with certain control sequences. Use a value of 0 if the *magic:* and *value:* numbers do not apply (which is usually the case).

Descriptions of PCSD Bytes

The PCSD bytes are arranged as follows:

0–3	Initializes printer, beginning of document.
4–7	Resets printer, end of document.
8–13	Sets form length, first part. The parameter is expressed in units of lines, where there are normally six lines per inch.
128–131	Begin bold.
132–135	End bold.
136–139	Begin italic.
140–143	End italic.
144–149	Begin underline.
150–153	End underline.
154–159	Begin strikethrough.
160–163	End strikethrough.
212–215	Begin red text.
216–219	Begin green text.
220–223	Begin blue text. If a printer has two shades of blue, Multiplan expects light blue (cyan) to be at byte 220.
224–227	Begin violet text. If a printer has two shades of blue, Multiplan expects the darker blue to be at byte 224.
228–231	Begin magenta text.
232–235	Begin yellow text.
240–243	End color (return to black).

)P This code marks the end of the Printer Control Sequence Description section.

Some PRD files may have additional modification values that are specific to that printer.

Sample PRD Text File

```
MAKEPRD 2.00
dxaMin:12 dyaMin:30 PrinterType:1
Microspace:0 SpecialFlags:0 SerialInterface:40960
WidthTSwap:0

{M
cPMDs:1

InhibitCTT:0 InhibitRevLF:0
LinedrawAutoMap:0 LinedrawNoShade:0
LinedrawFlag:1 LinedrawFont:1 LinedrawAdjust:0
ColorMod:0 ColorFlags:0 DuplexFlag:0 OrientationFlag:0
AutoSkipTop:0 UnprintableTop:0
AutoSkipLeft:0 UnprintableLeft:0
UnprintableBottom:0 UnprintableRight:0
DownloadFlag:0
GraphicsNotSupported:NIL
FontsNotSupported:NIL
BinsSupported:NIL
IniFile:NIL
ModelName:Generic
}M

{F0
CTP:T0
cPSDs:2

FontSize:24
Wtps:12 12 12 12
beginmod:0
endmod:0
beginItalicmod:0
endItalicmod:0
beginBoldmod:0
endBoldmod:0
beginItalBoldmod:0
endItalBoldmod:0
DLF:0
LineSpacing:12

FontSize:32
Wtps:24 24 24 24
beginmod:0 "^[!"
endmod:0 "^["“"
```

```
beginItalicmod:0
endItalicmod:0
beginBoldmod:0
endBoldmod:0
beginItalBoldmod:0
endItalBoldmod:0
DLF:0
LineSpacing:14
FontName:Pica
}F

{F1
CTP:T0
cPSDs:2

FontSize:24
Wtps:12 12 12 12
beginmod:0 "^[*1"
endmod:0 "^[*0"
beginItalicmod:0
endItalicmod:0
beginBoldmod:0
endBoldmod:0
beginItalBoldmod:0
endItalBoldmod:0
DLF:0
LineSpacing:12

FontSize:32
Wtps:24 24 24 24
beginmod:0 "^[*1^[!"
endmod:0 "^["^[*0"
beginItalicmod:0
endItalicmod:0
beginBoldmod:0
endBoldmod:0
beginItalBoldmod:0
endItalBoldmod:0
DLF:0
LineSpacing:14
FontName:Courier
}F
```

```
{T0
cCSD:1 chFirst:128 chLast:175
128: "C^H," 129: "u^H"¨" 130: "e^H'" 131: "a^H^0d094 "
132: "a^H"°" 133: "a^H`" 134: "a" 135: "c^H,"
136: "e^H^0d094 " 137: "e^H"¨" 138: "e^H`" 139: "i^H"¨"
140: "i^H^0d094 " 141: "i^H`" 142: "A^H"¨" 143: "A"
144: "E^H'" 145: "a" 146: "A" 147: "o^H^0d094 "
148: "o^H"¨" 149: "o^H`" 150: "u^H^0d094 " 151: "u^H`"
152: "y^H"¨" 153: "O^H"¨" 154: "U^H"¨" 155: "c^H/"
156: "#" 157: "Y^H=" 158: "P" 159: "f"
160: "a^H'" 161: "i^H'" 162: "o^H'" 163: "u^H'"
164: "n^H~" 165: "N^H~" 166: "a^H_" 167: "o^H_"
168: "^0d168 " 169: "^0d169 " 170: "^0d170 " 171: "^0d171 "
172: "^0d172 " 173: "^0d173 " 174: "<^H=" 175: ">^H="
}T
{P
byte:0 mod:0 "^[^ZI"
byte:4 mod:0
byte:8 mod:0 magic:0 value:0
byte:14 mod:0
byte:18 mod:0 magic:1 value:0 "^[^^"
byte:24 mod:0
byte:28 mod:0 magic:1 value:125 "^[^_"
byte:34 mod:0
byte:38 mod:0
byte:42 mod:0
byte:46 mod:0
byte:50 mod:0
byte:54 mod:0
byte:58 mod:0
byte:62 mod:0
byte:66 mod:0
byte:70 mod:0
byte:74 mod:0
byte:78 mod:0 "^[^J"
byte:82 mod:0 magic:0 value:0
byte:88 mod:0
byte:92 mod:0
byte:96 mod:0
```

```
byte:100 mod:0
byte:104 mod:0
byte:108 mod:0
byte:112 mod:0
byte:116 mod:0
byte:120 mod:0
byte:128 mod:2
byte:132 mod:0
byte:136 mod:4
byte:140 mod:0
byte:144 mod:4 magic:0 value:0 "^[I"
byte:150 mod:0 "^[J"
byte:154 mod:2 magic:0 value:0
byte:160 mod:0
byte:164 mod:2 magic:0 value:0
byte:170 mod:0
byte:174 mod:0 magic:0 value:0 "^[D"
byte:180 mod:0 "^[U"
byte:184 mod:0 magic:0 value:0 "^[U"
byte:190 mod:0 "^[D"
byte:194 mod:0 magic:0 value:0
byte:200 mod:0
byte:204 mod:0
byte:208 mod:0
byte:212 mod:0
byte:216 mod:0
byte:220 mod:0
byte:224 mod:0
byte:228 mod:0
byte:232 mod:0
byte:236 mod:0
byte:240 mod:0

}P
E
```

Questions About MakePRD

- *How can I tell if a printer is parallel or serial by looking at the printer driver file?*

  You can't. Most printer driver files have a serial interface listed even though they are used with parallel printers. A serial interface number (40960 or 49152) is included because someone might want to use that printer as a serial printer. If the printer is being used as a parallel printer (LPT1: is selected in the "adapter" field of the Print Setup command), Multiplan ignores the value in the SerialInterface flag.

- *How do I enter a caret (^) into the character translation table? Won't Multiplan interpret it as a control code?*

  Insert it as a decimal number. For example, if you want the letter e with a ^ (caret) over it, type **"e^H^0D9d"** in the character translation table.

- *What is meant by a "CR pass with backspace correction"?*

  This printer mode uses a carriage return pass for the underline, then uses microspacing and backspacing for adjustment so the underline starts and stops as close as possible to the start and end of the text being underlined. It affects how the print head on the printer moves.

- *Why am I getting the message "encounter too long a string" when converting back to a binary PRD file?*

  This means that you left a quotation mark off of one of the control codes. For example if the code had "^[P with no quotation mark at the end, this is interpreted as an infinite string and MakePRD responds with the message *"encounter too long a string."*

- *When running MakePRD, why do I get the message "text file wrong format"?*

  There are two possible reasons.

  After modifying a PRD text file, you may not have saved the file as ASCII text. MakePRD can't use files saved in the special formats of many word processors; the files must be ASCII text. Reload the file into your text editor or word processor and save it as ASCII text.

  The message would also appear if you left a blank line above the MakePRD statement.

Sending Initialization Sequences and Other Control Codes to a Printer

This section is intended for users of Multiplan 3.0 who use printer initialization (or setup) sequences or who have embedded **printer control codes** in cells in their worksheets. The embedded control codes (also called escape codes, escape sequences, or control sequences) control fonts, styles, and other printing attributes. This section explains how to make a PRD file that replaces the "setup" field of the Print Options command in Multiplan 3.0 (a field that no longer exists). Use this information to print worksheets that you do not intend to update for Multiplan 4.2. However, specifying the correct PRD file in the Print Setup command and then choosing the Format Font and Format Styles commands is the recommended method for applying fonts and styles to your worksheets.

You may also want to embed control codes in your worksheet if your printer supports more styles or print modes than Multiplan does. See your printer manual for information about what print modes are possible and what special characters to send to set the modes on your printer. Most users can skip the remainder of this appendix if they specify the correct printer driver using the Print Setup command.

Sending control codes to a printer consists of two operations:

- Sending an initialization sequence to the printer
- Typing other control codes directly into the cells in the worksheet (these codes are called embedded control codes)

If your printer does not require an initialization sequence (that is, if the "setup" field of the Print Options command in Multiplan 3.0 is blank), then you can just set the "printer" field of the Print Setup field to TEXT, and enter the embedded control codes into individual cells as explained later in this appendix.

If your printer does require an initialization sequence (that is, if the "setup" field of the Print Options command in Multiplan 3.0 is not blank), then you can send the initialization sequence to the printer by modifying the PLAIN.PRD file as explained below. You can also enter the initialization sequence as an embedded control code at the beginning of the worksheet in cell R1C1. Then you can enter the other embedded control codes—the codes that activate and deactivate specific fonts, styles, and print modes—into other cells throughout the worksheet.

Using PLAIN.PRD to Initialize a Printer

With Multiplan 4.2, you can run the MakePRD program and modify the PLAIN.PRD printer driver in order to initialize your printer and print Multiplan 3.0 worksheets. If you need to review how to use MAKEPRD.EXE, see "Using the MakePRD Program" earlier in this appendix.

To initialize your printer with PLAIN.PRD

1. Run the MakePRD program to create a text file based on the contents of PLAIN.PRD.

   For example, at the DOS prompt (or in the DOS window if you're using OS/2), you could type: **makeprd /t plain.prd plain.doc**
2. Load the text file into a text editor or word processor.
3. Move your text editor's cursor to this section of the new text file:

```
{P
byte:0 mod:0
byte:4 mod:0
byte:8 mod:0 magic:0 value:0
byte:14 mod:0
byte:18 mod:0 magic:0 value:0
```

4. Type the initialization sequence at the end of the second line from the top (byte:0 mod:0), and enclose the sequence with double quotation marks. Enter the codes according to the rules presented in "Entering Control Codes" and "Converting Control Codes" earlier in this appendix.

   For example, if the initialization sequence for your printer is "Escape @" then you would modify the second line to look like this: **byte:0 mod:0 "^[@"**

NOTE In Multiplan 3.0, you entered hexadecimal codes in the "setup" field of the Print Options command as &H*xx* where *xx* was the hex value of the control characters (for example, &H1B). Now, in MakePRD, you must enter those hexadecimal numbers as "^0*xx*" where *xx* is the hex value (for example, "^01B").

5. Save the text file and exit the text editor.
6. Run the MakePRD program to create a PRD file based on the contents of the text file.

   For example, at the DOS prompt (or in the DOS window if you're using OS/2), you could type: **makeprd /p plain.doc mp3setup.prd**
7. Start Multiplan and load the worksheet that has the embedded control codes.
8. Choose Print Setup and type the name of the printer driver in the "printer" field.

   For example, in the "printer" field, you could type: **mp3setup**
9. Press Enter.

When you print the worksheet, Multiplan extracts the initialization sequence from the MP3SETUP.PRD file and sends this sequence to the printer when printing starts. The printer responds to any embedded control codes as it did in Multiplan 3.0.

Example Suppose your printer's initialization sequence is "Escape Ctrl+Z I" and you want to create a new PRD file called MP3SETUP.PRD.

1. At the DOS prompt (or in the DOS window if you're using OS/2), type: **makeprd /t plain.prd plain.doc**
2. Edit the PLAIN.DOC file by moving the cursor to the {P section, and then change it to look like this:

```
{P
byte:0 mod:0 "^[^ZI"
byte:4 mod:0
byte:8 mod:0 magic:0 value:0
byte:14 mod:0
byte:18 mod:0 magic:0 value:0
```

3. Save the file.
4. At the DOS prompt (or in the DOS window if you're using OS/2), type: **makeprd /p plain.doc mp3setup.prd** and press Enter.
5. Start Multiplan.
6. Choose Print Setup and type **mp3setup** in the "printer" field.

Embedding Printer Control Codes in Cells

An advantage of PRD files is that you can avoid having to enter printer control codes into the worksheet itself. Instead you choose the Format Font and Format Style commands to have Multiplan apply special printing attributes for you. For more information, see "Format Font" and "Format Style" in Chapter 13, "Commands."

If your printer has more styles or print modes than Multiplan supports, then you can enter control codes directly into the worksheet. The way you enter control codes into cells is not the same as the way you enter them into PRD files.

To embed printer control codes in cells

1. Move the cell pointer to the cell into which you want to embed control codes.
2. Choose Alpha.
3. For each control code (or control character) with a decimal ASCII value of less than 32, press Ctrl+b followed by the letter or other character that has an ASCII value equal to that of the control character plus 64.

   For example, to enter the Esc key, which has an ASCII value of 27, press Ctrl+b and then type [(the left square bracket). The [character has an ASCII value of 91, and 91–64 equals 27.
4. For each control code with a decimal ASCII value between 32 and 255 (inclusive), press and hold Alt, type the decimal code on the numeric keypad, and then release Alt.
5. Press Enter.

   Pressing Ctrl+b instructs Multiplan to subtract 64 from the ASCII value of the next character you type. In general, you can enter any control character by pressing Ctrl+b and then typing the character. For example, to enter Ctrl+K, press Ctrl+b and then type **K**

   You can also use the CHAR function to enter control characters in cells. For more information, see "CHAR" in Chapter 14, "Formulas and Functions."

NOTE You can use the method given in step 4 to enter graphics characters with an ASCII value greater than 127 into cells. However, if your printer does not support the IBM U.S. extended character set, or if your printer reserves ASCII values greater than 127 for special printing codes, then your printer will not print the same characters you see on the screen. For more information see "Character Translation Table" earlier in this appendix.

IMPORTANT If you use a printer driver along with embedded control codes, then the codes in the PRD file and the codes you enter may conflict with each other. If such a conflict occurs, use the TEXT printer driver. You can also use the MakePRD program to create a new printer driver based on PLAIN.PRD. Byte 0 sends initialization sequences to the printer, and byte 4 sends reset codes. For more information, see "Using the MakePRD Program" and "Using PLAIN.PRD to Initialize a Printer" earlier in this appendix.

Example Suppose that the code for superscript on your printer is "Esc S0" (escape, followed by an uppercase S and the number zero), that the code to cancel superscript is Esc S1, and that you want to print the following line at the top of your worksheet: "The following table shows several values of Y^2."

To enter the embedded printer control codes

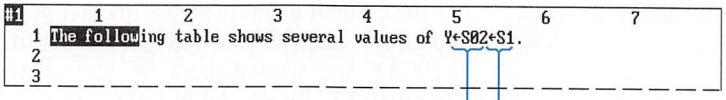
1. Choose Format and format R1C1:C6 as continuous (@[cont]).
2. Choose Alpha and type **The following table shows several values of Y**
3. Press Ctrl+b and type [(the left square bracket) to enter the Esc character.

   Notice that the square bracket appears as a left arrow.
4. Type **S0** (uppercase S, zero).

   This code activates the printer's superscript mode.
5. Type **2**

   This is the text you want as a superscript.
6. Press Ctrl+b and type **[S1**

   This code cancels the printer's superscript mode so that the period will not be a superscript.
7. Press Enter.



"Esc S0" activates superscript mode. The escape character appears as ←.

"Esc S1" deactivates superscript mode.

Now when you print the worksheet, the printer superscripts the 2. Your printer may not support superscripts, and even if it does, it may use different control codes to activate and cancel this style.

Appendix C
Tips and Additional Information About Multiplan

This appendix contains additional information about Multiplan that you may find useful.

This appendix explains:

- How to use Multiplan with floppy drive systems and hard disks.
- How to convert worksheets created by previous versions of Multiplan.
- What files come with Multiplan.
- What the MP.INI file is.
- How to resolve problems with file access.
- How Multiplan uses memory.
- When Multiplan reads from and writes to files.
- What happens to references when you change the worksheet by moving, deleting, and inserting information.
- How to jump to distant areas of the worksheet by thumbing with the mouse.
- Using a math coprocessor.

Using Floppy Disk Drives and Hard Disks

The **startup drive** is the drive that Multiplan starts on. Multiplan always looks for its own program information and its Help files on the startup drive. If Multiplan is on a hard disk, the hard disk is the startup drive. If Multiplan is on a floppy disk, the drive containing the Multiplan Program disk or the Multiplan bootable disk is the startup drive.

Any drive other than the startup drive is called a **data drive**. You put floppy disks containing data such as worksheet files in a data drive. Unless you specify otherwise, DOS assumes that any filename you type refers to a file in the current drive, so initially the startup drive is also the data drive. Most hard disk systems use the hard disk as both the startup drive and the data drive.

Using Several Drives

While working with Multiplan, you might use several disk drives. For example, if you are working on a floppy disk system with two disk drives, keep Multiplan program files on one disk and the worksheets on a data disk. If you are working on a hard disk system, you may want to store information you use only occasionally on a floppy disk rather than having it take up space on the hard disk.

There are several ways to tell Multiplan which drive contains the file you want:

- If you specify a drive when you type a filename in any of the Print or Transfer commands, Multiplan looks for or saves the file on the floppy disk or hard disk in the drive you specify. For example, you could type **b:spencer** to tell Multiplan to look for or create the file named SPENCER in drive B.
- If you don't specify a drive when you type a filename, Multiplan checks the "setup" field of the Transfer Options command. To set up Multiplan so that it always saves and looks for your worksheets on a specific drive and directory path, type the drive and directory path in the "setup" field of the Transfer Options command. For more information, see "Transfer Options" in Chapter 13, "Commands."
- If you place a period (.) in the "setup" field of the Transfer Options command or if you delete the proposed response in this field, then Multiplan saves files to the current drive and directory path. The period setting is saved in the MP.INI file, but the deleted (blank) response is not.
- If you don't specify a drive with any of the preceding options, Multiplan looks for or saves the file on the startup drive and directory path.

Changing Floppy Disks

It is safe to change floppy disks in any drive when you see the system prompt (for example, A>) or when DOS or OS/2 displays a message on the screen asking you to change floppy disks.

When you are working with Multiplan, it is safe to change floppy disks in the data drives when you can see the main command menu on the screen or when Multiplan displays the messages *Disk full* or *Enter Y to retry access to filename*. If Multiplan displays either of these messages, press Y after you change the floppy disks; otherwise, Multiplan cannot save worksheets on the floppy disk.

WARNING Never change floppy disks when the light on the drive is on. You may destroy the information on them, and you may lose the information you have in the computer's memory. Also, never remove any disk while Multiplan is showing Help text on the screen.

Converting Worksheets from Previous Versions of Multiplan

Multiplan 4.2 automatically loads worksheets created by Multiplan version 2.0 and higher. If you load worksheets created in Multiplan version 2.0 or 3.0, the Normal mode is automatically selected when you choose the Transfer Save command. You will probably want to convert worksheets from Multiplan version 4.0 to the new Normal format.

To convert a worksheet from Multiplan 4.0

1. Start Multiplan 4.2.
2. Choose Transfer Load to load your old file.
3. Choose Transfer Save to save the file with the same or a new name.
4. Select Normal in the "mode" field.

NOTE By default, Multiplan 4.2 stores its files in a Normal native binary format; Multiplan 4.0 and Microsoft Excel use the binary interchange file format (BIFF).

Converting Worksheets from Multiplan Version 1

Multiplan 4.2 cannot automatically load worksheets created by Multiplan version 1, but you can still convert them to the new format.

To convert a worksheet from Multiplan version 1

1. Start Multiplan version 1 and load the old worksheet.
2. Choose Transfer.
3. Choose Options and set the "mode" field to Symbolic.
4. Choose Transfer.
5. Choose Save and save the worksheet under a new name.

   The worksheet is now in symbolic format.
6. Exit Multiplan version 1.
7. Start Multiplan version 4.2 and load the symbolic worksheet.
8. Choose Transfer.
9. Choose Save and save the worksheet under a new name in Normal format.

Multiplan Disks

Multiplan comes on three 5.25-inch floppy disks (Setup, Program, and Utilities) or two 3.5-inch floppy disks (Program and Setup/Utilities).

- The Setup Disk contains example worksheets and data files, the Multiplan Help file, the README.DOC file, the SETUP program, printer driver files (*.PRD), and the mouse driver file.
- The Program Disk contains the Multiplan program, printer driver files, and video adapter files (*.VID).
- The Utilities Disk contains the video adapter files, printer driver files, the MakePRD program, and the PRINTERS.DOC file.

The Setup disk contains the Multiplan example worksheets and other files. A complete directory of this information is included on the Utilities disk.

To see the directory of example worksheets and files

1. Insert the Utilities disk in drive A.
2. Type **a:showme** to display the directory on your screen.

The MP.INI File

The MP.INI file holds setup information for Multiplan, such as screen colors, screen height, borders, the international display option, and so on. Multiplan looks for the MP.INI file in the drive and directory where Multiplan is installed—unless Multiplan is running on a network or under OS/2, or you start Multiplan using the /n switch. If Multiplan cannot find the MP.INI file, it creates one using default setup information.

Every time you quit, Multiplan saves certain setup information in MP.INI. Multiplan saves the conditions you have set in the following commands:

- Format Cells (all custom format information)
- Format Default Height
- Options (except for "old menus" and "iteration")
- Print Margins
- Print Setup
- Transfer Options ("setup" field)
- Window Border
- Window Paint

The next time you load Multiplan, the fields in these commands contain the same responses they contained when you quit. For information on which custom formats are stored in the MP.INI file, see the explanation of creating custom formats under "Format Cells" in Chapter 13, "Commands." For information on using the MP.INI file on a network, see "Using the MP.INI File on a Network" in Appendix A, "Using Multiplan on a Network."

Problems with File Access

If you have problems with file access, check for possible causes from the following two lists:

Problem reading file	Possible solution
The file may not be on the disk	Use the Transfer Load command and the direction keys to display the directory of files.
You see a *Disk error* message	Restore a copy of the file from the most recent backup and try again.
The information is not in the expected format	The External Copy command requires that worksheets be saved in Normal or Excel mode.
The information is not up-to-date	Incorrect procedures may have been used to update a collection of externally linked worksheets. For details, see Chapter 4, "Linking."
The disk is full	Disks can store only a limited amount of information. Use a different disk, or erase some of the information on this disk, and try again.
The disk is write-protected	The information on the disk may be valuable. Use another disk, or remove the write-protection, but first consider why the disk is write-protected.
Errors during writing, such as an interruption, may leave incorrect information on the disk	Make sure that write operations are complete before removing the disk from the drive.

Memory

As you fill up cells in the worksheet, you use up memory. Large worksheets take longer to recalculate and save than small worksheets. Use the External Copy command to break a large worksheet into several smaller worksheets. For more information, see Chapter 4, "Linking."

To save memory when formatting, set the default formats to the most common format in the worksheet. Use the Format Cells and Format Width commands to format the less common cells and column widths. Don't format cells that are never going to be used; formatting takes up memory.

To see how many bytes of memory you have used, choose Options and press Enter.

Reading and Writing Multiplan Files

The following lists describe when Multiplan reads files and when it writes files.

Multiplan reads files when:

- A worksheet is specified on the DOS or OS/2 command line when you start Multiplan (for example, **c:\mp\mp budget**).
- A worksheet is loaded with the Transfer Load command.
- A worksheet is loaded that has supporting worksheets—the supporting worksheets are read.
- The External Copy, External Renew, or External Total commands are performed—the source worksheet is read.
- The External Use command is performed—the affected copies are redone and the source worksheets are read.
- Commands are performed or help is requested—the Multiplan program and Help files are read.
- The Print Printer command is performed or the printer driver is changed—the printer driver is read.

Multiplan writes files when:

- A worksheet is saved in any mode with the Transfer Save command.
- A worksheet is renamed or deleted—the file directory is read or written.
- The Print File command is performed.
- The Run Report File command is performed.
- Worksheet linking relationships change—in this case, the Transfer Save and Transfer Rename commands update supporting worksheets.
- You perform the Quit command—the MP.INI file, which contains user option settings for Multiplan, is written.

Changing the Worksheet

Because inserting, deleting, moving, or sorting may change the location of cells, Multiplan also automatically adjusts any references to the cells, whether they occur in formulas or in the definition of names. However, the adjustments to some references after the worksheet has been transformed may cause problems.

When Cells Change Location

When you delete, insert, move, or sort rows or columns, consider the following possible problems:

- References to cells that have been deleted from the worksheet are replaced by #REF! error values. All formulas that contained the references must be edited. These formulas are found by inspecting the cells that display the #REF! error value.
- If the reference is to a group of cells and the transformation would distort a rectangular part of the group into a more complex shape (for example, if a corner cell is deleted from a rectangular area), the name definition is not changed.
- If you insert cells next to a group of cells, Multiplan does not update references to the group to include the new cells. If you want to enlarge the group, insert the new cells in the interior of the group rather than at the boundary of the group.
- If you delete a cell that is used by another cell's formula, you may cause an error in the other cell.

Restoring Row Order

The Sort command may move many rows and, therefore, may cause any of the preceding problems. If you number the rows on your worksheet, you can sort on the row number to get back to the original order. You can have Multiplan number rows for you with this procedure.

To number rows

1. Turn off the automatic recalculation in the Options command.

   If you do not turn off the automatic recalculation, Multiplan will immediately recalculate the row numbers, and you will lose the previous order.
2. Pick a column to use for the row numbers. You could insert a column at the left of the worksheet and then set the width to 0 if you don't want to see the column.
3. Move the cell pointer to first cell in the column.

4 Type **row()**

The ROW function returns the number of the row the cell is in.

5 Press the Down Arrow key.

6 Copy this formula down as far as necessary.

You can now sort using this column to return the rows to their current order.

Thumbing with a Mouse

You can jump to any part of a worksheet by **thumbing**. You thumb to distant areas of the worksheet by moving the mouse pointer to the top or left margin and clicking both mouse buttons simultaneously. The worksheet scrolls to a location that is relative to the location of the mouse pointer in the margin and the cell in the farthest row or column used in the worksheet.

For example, suppose your worksheet has information in cells R1C200, and R3500C1. If you move the mouse pointer to the middle of the top margin and click both mouse buttons simultaneously, Multiplan thumbs to the middle of the worksheet, column 100, and displays that area of the worksheet on the screen.

Similarly, if you move the mouse pointer to the middle of the left margin and click both mouse buttons at once, Multiplan thumbs to the middle of the defined area, row 1500. If you click the buttons again, Multiplan displays the area of the worksheet half the distance from where you are now (row 1750) to the end of the worksheet (row 3500), and you see the area around row 2575.

The important thing to remember with thumbing is that Multiplan always uses the cells farthest to the right and down as its reference points. If most of your worksheet is in the first 100 rows, but you have macros or headings in row 1000, Multiplan will thumb relative to row 1000. You can find out where the end of the worksheet is by pressing End. This moves the cell pointer to the end of the worksheet.

You can thumb to the last column used in the worksheet by moving the mouse pointer to the far right end of the top of the screen and clicking both mouse buttons simultaneously. You can also thumb to column 1 by moving the mouse to the far left end of the top of the screen and clicking both mouse buttons at once. You can thumb to the top or bottom row by moving the mouse pointer in the left margin in a similar manner. You can thumb bigger or smaller percentages of the worksheet by moving the mouse pointer to one end or the other of the margin and clicking both buttons.

It doesn't matter where you are in the worksheet. The worksheet automatically thumbs the correct direction and distance, and the screen displays the area of the worksheet that is equal to the mouse pointer's relative position on the margin of the screen and the distance to the beginning or end of the worksheet.

The best way to learn how to use the mouse for scrolling and thumbing is to try it yourself. Practice moving around the worksheet until you are comfortable with it.

Using a Math Coprocessor

If your computer has either an 8087, 80287, or 80387 math coprocessor, Multiplan detects it automatically and uses it to speed up all math routines.

Appendix D
Multiplan's New Features

This appendix is intended for experienced users of Multiplan who want to know what new features are available in Multiplan 4.2. If you are upgrading from Multiplan 4.0, then you should read the following section. If you are upgrading from Multiplan 3.0, then you should read both of the following sections.

Upgrading from Multiplan 4.0

If you are an experienced user of Multiplan 4.0, the following features of Multiplan 4.2 will be new to you.

Copying Cells

When you copy a cell or range of cells, you can copy all attributes of the source cells or just the formulas, values, or formats. You can also transpose cells when you copy by choosing the Copy Transpose command. For more information, see "Copy Down," "Copy From," "Copy Right," and "Copy Transpose" in Chapter 13, "Commands."

Displaying the Alpha Command

The Options command now includes a "hold alpha" field, so Multiplan can continue to display the Alpha command after you enter information into cells. This feature is especially useful if you need to enter a series of dates and times or any series of numeric characters as text. For more information, see "Options" in Chapter 13, "Commands."

International Display Option

The way Multiplan displays certain information depends on the country code setting in your CONFIG.SYS file. You can also start Multiplan with the /z command line switch if you want Multiplan to display the international symbols described throughout this manual. For more information, see "Using the International Display Option" in the "Getting Started" chapter.

Loading and Saving Files

Multiplan automatically loads files created by Multiplan (versions 2.0 and higher), Microsoft Excel, Lotus 1-2-3, Symphony, and files written in the Symbolic Link (SYLK) format. Multiplan can load ASCII files if you specify ASCII with the Transfer Options command. You can display an online list of all files, drives, and directories and then select the file you want to load. Multiplan also displays the number of bytes remaining on the disk at the bottom of the list.

You can save files in Normal, Symbolic, Microsoft Excel, Lotus, ASCII, or Microsoft Chart formats. The Transfer Import command appears only if Yes is selected in the "old menus" field of the Options command. You can also save part of a worksheet in ASCII format by specifying a save area in the Transfer Save command.

For more information, see "Transfer Load," "Transfer Options," and "Transfer Save" in Chapter 13, "Commands."

New Commands

Multiplan 4.2 has changed some of its commands and command fields. It also now supports more of the commands used in Microsoft Excel, so exchanging information with Microsoft Excel is even easier. All of the commands are listed alphabetically in Chapter 13, "Commands." The commands that have been added or changed are:

Alpha	Print Setup
Copy Down	Run Report File Cross-Ref
Copy From	Run Report Print Cross-Ref
Copy Right	Transfer Load
Copy Transpose	Transfer Options
Options	Transfer Save

New Functions

Multiplan 4.2 has nine more functions than Multiplan 4.0. For a complete explanation of these functions, see Chapter 14, "Formulas and Functions." The new functions are:

AREAS	ROUNDDOWN
CELL	ROUNDUP
CLEAN	ROWS
COLUMNS	TEXT
RANK	

New Macro Codes

Multiplan 4.2 has two additional macro codes. The new macro codes are:

'FE Equivalent to pressing Shift+F3 (function enumeration). Use this keycode to display a list of functions. To display the list, you must follow the 'FE keycode with a keycode for a direction key.

'RF Equivalent to pressing F3 (reference). Use this keycode to change the highlighted relative reference to an absolute reference. Also, if you want to display a list of names, you can follow this keycode with a keycode for a direction key (name enumeration).

Page Size

The Print Margins command now includes a "page size" field so you can enter a page size by name. You can display a list of standard names and then select the page size you want. For more information, see "Print Margins" in Chapter 13, "Commands."

Upgrading from Multiplan 3.0

If you are an experienced user of Multiplan 3.0, the following features of Multiplan 4.0 will be new to you. These features are all available in Multiplan 4.2.

Changing Cell Width

You can use the direction keys to change the widths of cells when you choose the Format Width or Format Default Width commands. For more information, see "Format Width" or "Format Default Width" in Chapter 13, "Commands."

Creating a Database

You can create a database as part of your Multiplan worksheet. You can store and retrieve information in the database with commands from the command menu. In addition, Multiplan has statistical functions you can use with the database. For more information, see Chapter 11, "Database."

Displaying Old Menus

There are changes to several of the command menus between Multiplan 3.0 and Multiplan 4.0 and a few more changes between Multiplan 4.0 and Multiplan 4.2. In order for you to run macros that contain commands from Multiplan 3.0, you need to display and use the Multiplan 3.0 menus. For more information, see "Options" in Chapter 13, "Commands."

Formatting Cells

With Multiplan you can apply styles to information in cells so that when you print your worksheet, the information appears in bold, underline, strikethrough, italic, or a combination of these styles. You can change the color of information in individual cells, and you can change number formats depending on the cell's value. You can also search for and replace formats. For more information, see "Format Cells" and "Format Style" in Chapter 13, "Commands."

Margins

You can specify margins on your printed worksheet in characters, inches, or centimeters. For more information, see "Print Margins" in Chapter 13, "Commands."

Microsoft Windows

You can save and load worksheets or parts of worksheets saved in ASCII or SYLK format to the Windows Clipboard. For more information, see "Transfer Load" and "Transfer Save" in Chapter 13, "Commands."

New Functions

Multiplan 4.0 provided 35 more functions than Multiplan 3.0, including database, financial, mathematical, special, statistical, and text functions. All of the following functions are explained in detail in Chapter 14, "Formulas and Functions."

ACOS
ASIN
ATAN2
CHOOSE
COUNTA
DAVERAGE
DCOUNT
DCOUNTA
DDB
DMAX
DMIN
DPRODUCT
DSTEV
DSTEVP
DSUM
DVAR
DVARP
FACT
FIND
IMPT
ISERR
ISLOGICAL
LOG
PPMT
PRODUCT
REPLACE
SEARCH
SLN
STDEVP
SUBSTITUTE
SYD
TRUNC
VAR
VARP
VERSION

New Macro Codes

Multiplan has macro keycodes and macro command codes that allow you to duplicate edit key actions and to turn the menu and screen updating features off and on.

The macro codes included with Multiplan 4.0 are:

'EH Equivalent to pressing Shift+F8 (edit home). Use this keycode to move the cursor to the first character in an edit field.

'EE Equivalent to pressing Shift+F10 (edit end). Use this keycode to move the cursor to the end of the edit field.

'DM Disables the menus. When you use this macro command code, Multiplan does not update the menus for the remainder of the macro, or until Multiplan encounters an 'EM macro code, or another macro code that requires input, such as 'MC or 'QE. This allows Multiplan to perform complex and visually impressive macros without distracting you by updating the menu. Multiplan ignores this macro code in single-step mode.

'EM Enables the menus. Use this command code to turn the menu update back on during a macro after using the 'DM macro code.

'DS Disables the screen. When you use this macro command code, Multiplan does not update the screen for the remainder of the macro, or until Multiplan encounters an 'ES macro code, or another macro code that requires input, such as 'MC or 'QE. This macro code is similar to the 'DM macro code. Multiplan ignores this macro code in single-step mode.

'ES Enables the screen. Use this macro command code to turn the screen update back on during a macro after using the 'DS macro code. Multiplan updates the screen whenever it encounters this macro code.

OS/2 Support

Multiplan runs under the OS/2 operating system in protect mode. This means that you can run Multiplan at the same time as other applications.

Preselecting a Range of Cells

You can preselect ranges of cells in the worksheet before choosing a command. When you choose a command after preselecting an area, Multiplan usually proposes that area as a response in one of the command's fields. For commands that do not require explicit cell references, such as Insert and Delete, Multiplan proposes a response that is appropriate for the selected area. You can also preselect cells by dragging the mouse. For more information, see "Selecting a Range of Cells" in the "Fundamentals" chapter.

Printer Drivers

If you specify a printer driver (PRD) file for your printer, you can print your worksheet with bold, underline, italic, and strikethrough styles (if your printer and the printer driver support these styles), and you can select a page size from an online list. You can also print a quick "draft" copy of your worksheet without adding character enhancements to the text. For more information, see "Print Margins," "Print Setup," and "Print Options" in Chapter 13, "Commands."

Screen Changes

The Multiplan 4.0 screen has several enhancements:

- The status line indicator EX indicates "extend" mode (when you are preselecting a range).
- If you select several options, the appropriate status line indicators (NL, SL, CL, RM, EM, CM, ST, or EX) replace the word "Multiplan."
- During an external link, Multiplan displays the total number of cells to copy and then counts down to zero so you can monitor its progress.
- For mouse users, a "!" is located in the status line. Clicking the "!" causes Multiplan to recalculate the values in the worksheet, just like pressing F4.
- Messages appear in the message line that describe highlighted commands and command fields.
- You can display horizontal and vertical page breaks as part of the window border.

Selecting Functions

When you enter formulas, you can display an online list of all the functions and then select the one you want. The list of functions is divided into groups according to type: database, date, financial, and so on. For more information, see Chapter 14, "Formulas and Functions."

Sorting

You can sort by multiple rows or columns. Each specified row or column is treated as a separate sort key, with the first row or column in the list having the highest priority. For more information, see "Sort Columns" and "Sort Rows" in Chapter 13, "Commands."

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MICROSOFT PRODUCT ASSISTANCE REQUEST

Microsoft Product Support Services - Phone (206) 454-2030

Instructions

When you need assistance with a Microsoft product, call our Product Support Services group at (206) 454-2030. So that we can answer your question as quickly as possible, please gather all information that applies to your problem. Note or print out any on-screen messages you get when the problem occurs. Have your manual and product disks close at hand and have all the information requested on this form available when you call.

Diagnosing a Problem

So that we can assist you more effectively, please be prepared to answer the following questions regarding your problem, your software, and your hardware.

1. Can you reproduce the problem?
   ❒ yes ❒ no

2. Does the problem occur with another copy of the original disk of your Microsoft Software?
   ❒ yes ❒ no

3. Does the problem occur with another system (if available)?
   ❒ yes ❒ no

4. If you were running other windowing or memory-resident software at the same time, does the problem also occur when you don't use the other software?
   ❒ yes ❒ no

Product

Product name

Version Number

Registration Number

Software

Operating System

Name/Version number

Windowing Environment

If you were running Microsoft Windows or another windowing environment, give name and number of windowing software:

CD ROM Software

Name/Version number

Other Software

Name/Version number of any other software you were running when problem occurred, including memory-resident software (such as keyboard enhancers or print spoolers):

Hardware

So that we can assist you more effectively, please be prepared to answer the following questions regarding your problem, your software, and your hardware.

Computer

_____ _____
Manufacturer/model Total memory

Floppy-disk drives
Number: ❒ 1 ❒ 2 ❒ Other
Size: ❒ 3 1/2" ❒ 5 1/4"
Number of Sides: ❒ 1 ❒ 2
Density: ❒ Single ❒ Double ❒ Quad
Capacity:
5 1/4": ❒ 160K ❒ 360K ❒ 1.2 megabytes
3 1/2": ❒ 360K ❒ 400K ❒ 720K ❒ 800K
❒ 1.4 megabytes

System Memory

_____ _____
Manufacturer/model Total memory
(If using DOS, you can run CHKDSK to determine the amount of memory available. If using Apple Macintosh Finder, select "About The Finder..." from the Apple menu to determine the amount of memory available.)

Peripherals

Hard Disk

_____ _____
Manufacturer/model Capacity(megabyte)

Printer/Plotter

_____
Manufacturer/model

❒ Serial ❒ Parallel

Printer peripherals, such as font cartridges, downloadable fonts, sheet feeders:

_____

_____

Mouse
Microsoft Mouse: ❒ Bus ❒ Serial ❒ InPort™
❒ Other

_____
Manufacturer/model

Boards
❒ Add-on RAM board

_____
Manufacturer/model

❒ Graphics-adapter board

_____
Manufacturer/model

❒ Other boards installed

_____
Manufacturer/model

Modem

_____
Manufacturer/model

CD ROM Player

_____
Manufacturer/model

Version of Microsoft MS-DOS® CD ROM Extensions:

_____

Network

Is your system part of a network? ❒ Yes ❒ No

_____
Manufacturer/model

What hardware and software does your network use?

_____

_____

_____

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